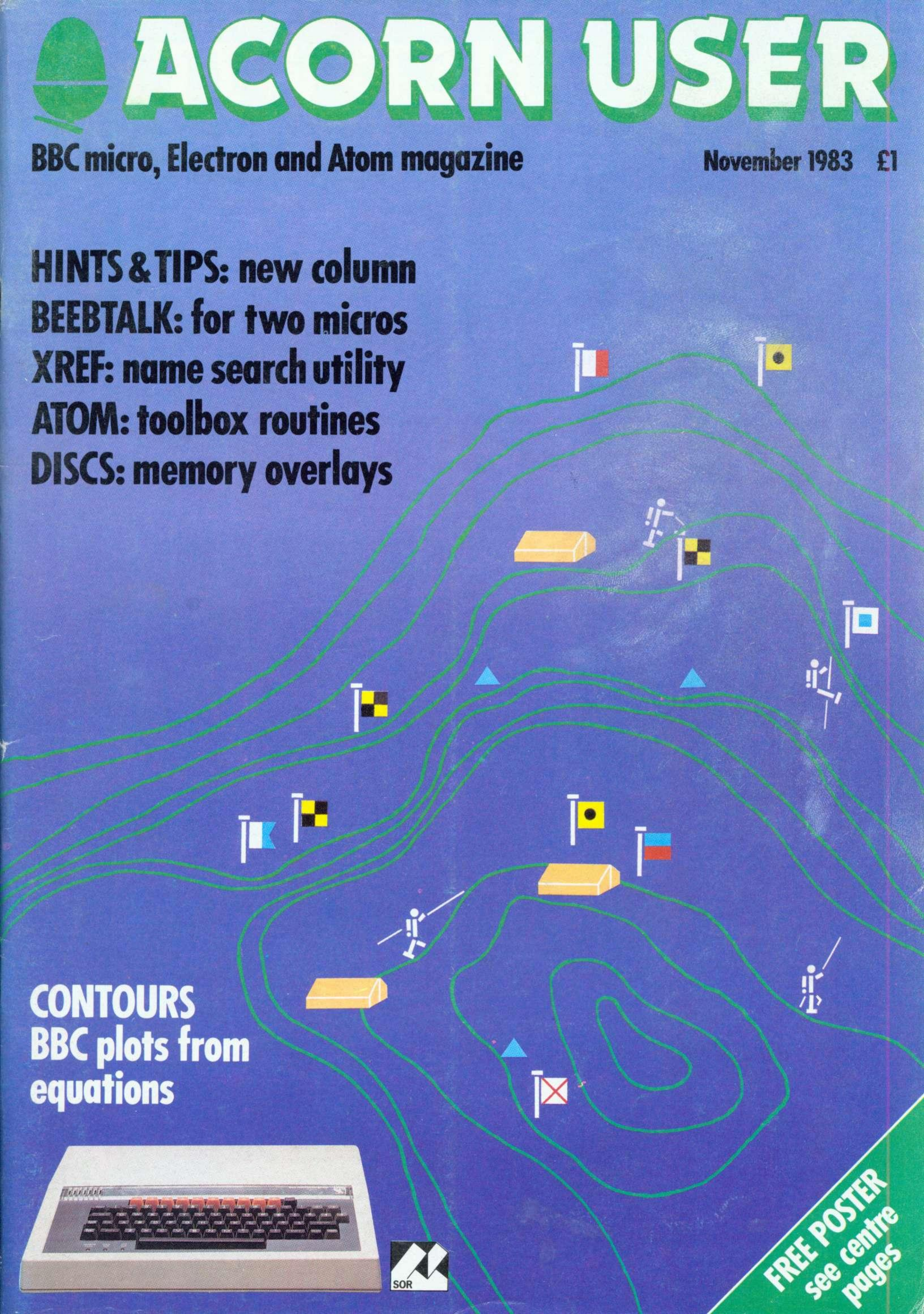
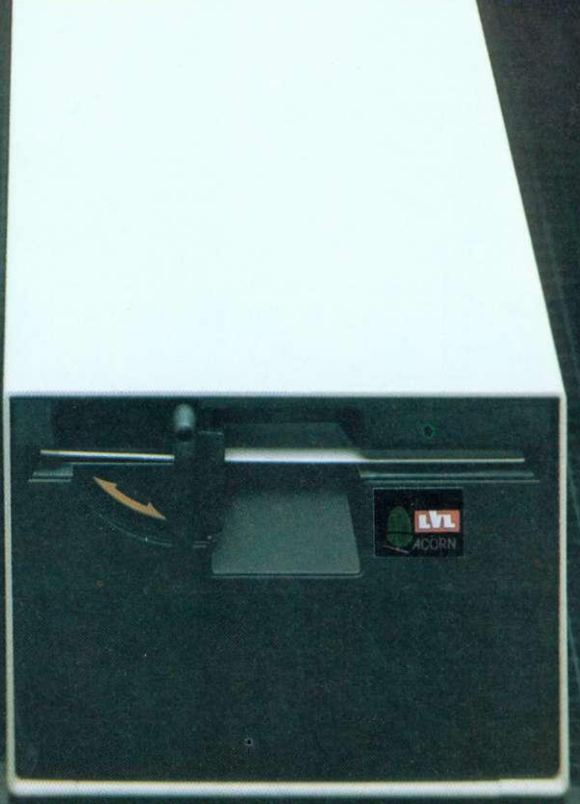

ACORN USER
BBC micro, Electron and Atom magazine
November 1983 £1
HINTS & TIPS: new column
BEEBTALK: for two micros
XREF: name search utility
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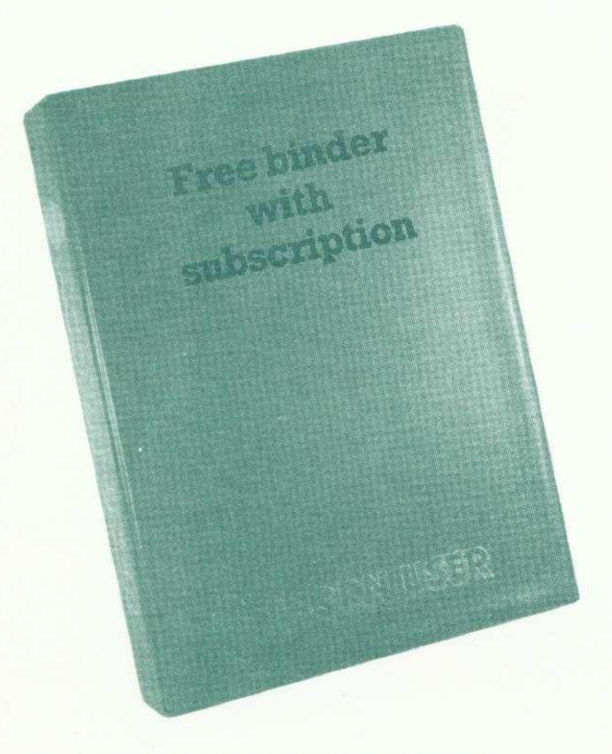


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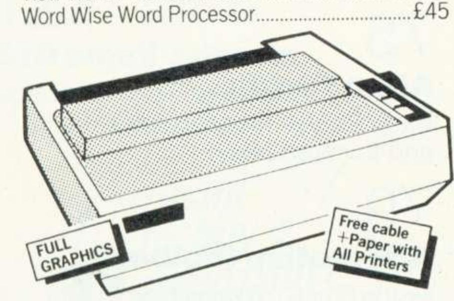
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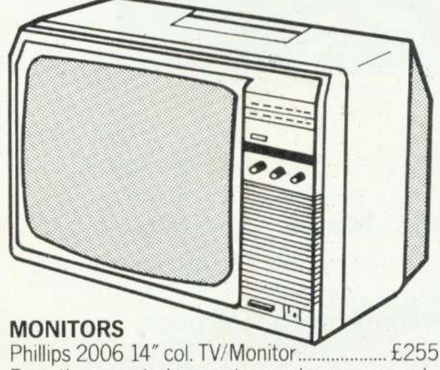
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Anger voiced

THREE issues have dominated the minds (and pens) of our readers. The first is the Atom, the second our articles on women in computing, and the third upgrading from tape to disc.

Atom owners – don't blame us if no one reckons the machine is worth supporting. The lack of products was strikingly demonstrated at the *Acorn User* exhibition – the only Atom on display was on our own stand! As readers have pointed out, perhaps BBC micro and Electron readers will be in the same boat three years from now. So it's by no means an isolated issue.

In October we wrote the headline 'Why the girls don't compute'. Replies – some in anger, some in frustration – have added to the reasons why, but few have suggested how the problem can be overcome. Obviously manufacturers, software houses, schools, journalists and magazines have failed to support women. So how do we do it?

Why don't Acorn (and presumably other software houses) operate an upgrade service from tape to disc?, asks one letter. The answer, we don't know (though a few do!). Sounds like time to kick up a fuss and go campaigning.

Our new look

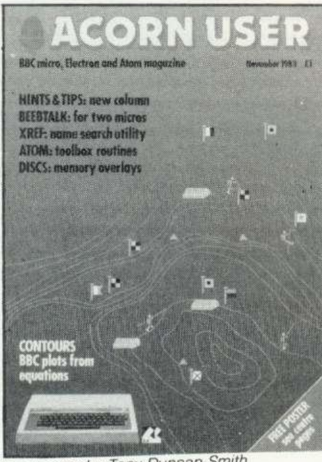
WELL, *Acorn User* has now been available over the counter for a full year (yes, yet another anniversary). So we decided to do some re-arranging and introduce a new column.

Letters and entries to Beeb Forum have shown a demand for another column to answer queries of a more general nature. So we've taken the Hints & Tips label from Joe Telford, and set Martin Phillips up under that banner.

'But what's happened to Joe?' you cry. Well, he now appears under Joe's Jottings and will guide you through a subject each month in a more detailed way.

Electron users will be pleased to know that in future, all articles will be tagged with teh Electron name if they are suitable. Also Beeb Forum will include the Electron (most of the past Forums will be suitable anyway).

Finally, some points on our design. You'll notice many changes in this issue in format, layout and typography. We've changed typesetters (three cheers to GM Graphics for sterling work over the past year), and the way we put *Acorn User* together. For better or worse? No doubt you will let us know.



Front cover by Tony Duncan-Smith

How to submit articles:
You are welcome to send articles to the Editor of *Acorn User* for publication. *Acorn User* cannot undertake to return them unless a stamped addressed envelope is enclosed. Articles should be typed or computer written with double line spacing. Black and white photographs or transparencies are also appreciated. If submitting programs a cassette or disc is vital. Payment is £50 per page or pro rata. Please indicate if you have submitted your article elsewhere. Send articles, reviews and information to: The Editor, *Acorn User*, 53 Bedford Square, London WC1B 3DZ. Tel: 01-631 1636.

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Coming soon in *Acorn User*:

Electron:
Interfacing to the edge connector with the pins properly explained

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The return of multi-coloured space invaders and other user-defined characters

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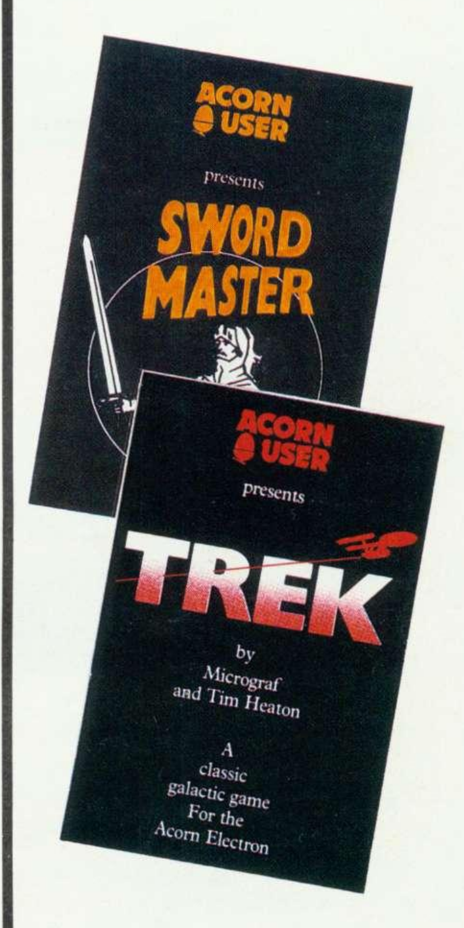
Adventures:
Special issue number two, with the experts explaining how these unusual programs are developed. Plus listings and reviews.

Authors please note

We've been inundated with articles for publication – many of an extremely high standard. It takes time to read them, try listings out and edit them – which is the only way to maintain standards. Also remember that magazines work at least two months in advance.

So please bear with us if you hear nothing for weeks (although all submissions are acknowledged).

Thanks for your patience and apologies for any frustration caused.



Acorn User launches software at £7.95

TWO games are now available from *Acorn User*. They are Sword Master (BBC B) and Trek (BBC B and Electron). Both make extensive use of the excellent graphics, speed and sound of the machines. Turn to page 15 for details.

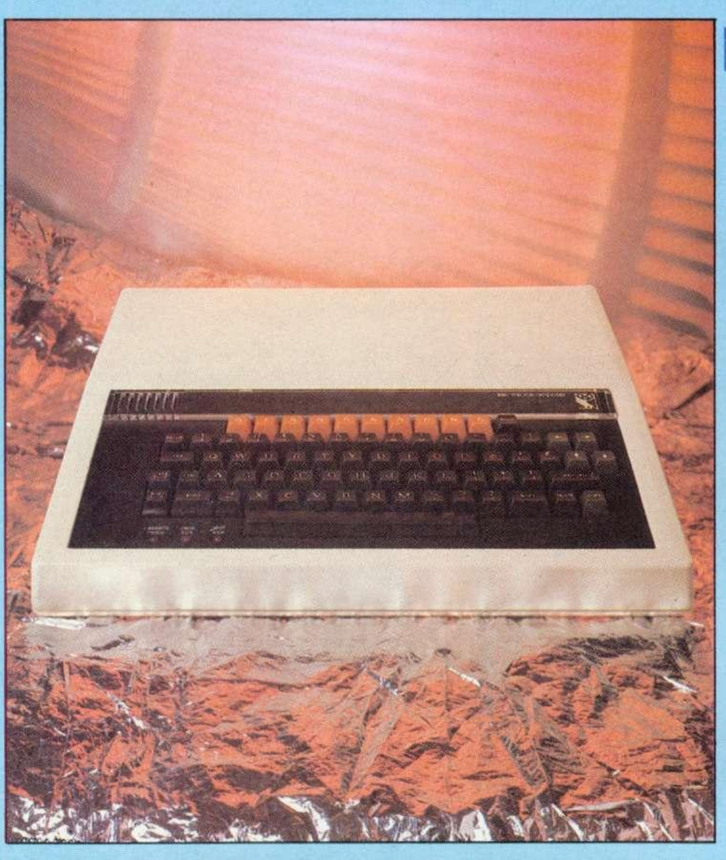
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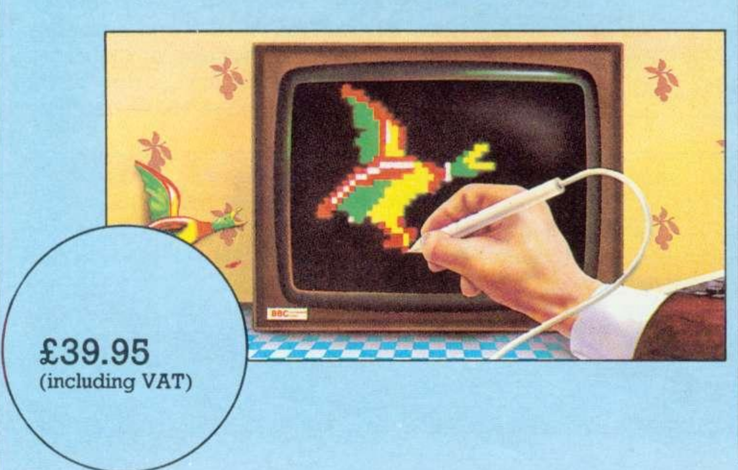
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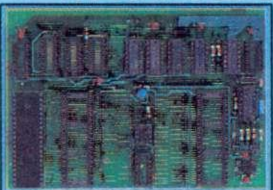
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Electron comes home

THE Electron is to be manufactured in Britain from the New Year – doubling Acorn's capacity.

AB Electronics, who already build the BBC micro and took over Cleartone earlier in the year, has signed a contract to produce 100,000 Electrons at a rate of 4,000 a week.

The company's Rogerstone plant in Gwent will handle the order, which has been won despite EEC tariffs on electronic components which make it cheaper to import ready-built computers than assemble them in Britain. (This was originally to encourage more chip production in Europe by companies such as Inmos, and there is no sign of the situation being altered.)

AB chairman Henry Kroch was obviously pleased to get the order, especially as the Electron is a much easier machine to assemble than the BBC micro. 'The BBC did not lend itself to automatic injection of components, but experience on the BBC micro has been incorporated which means the Electron lends itself much better to this process,' he said.

'But it's not like motor cars. Basically, we use automatic handling, feeding, soldering handling and testing. We don't use robots.'

However, AB does make use of the BBC micro on its production lines to test other BBC machines. Ken Brown, head of manufacturing, explained: 'If a circuit test on a Beeb shows a fault, and there are 700 components on the board, we have a TV showing a map of the PCB. The operator punches in an IC number and an arrow shows where the part is.

Quicker

'We used to use a grid map but this display generated by a BBC micro is much quicker.

'Then, in the despatch area, a BBC is used to sort machines coming off the lines into order according to serial number.'

Other uses include quality control and testing, where trends and costs are analysed by a Beeb. Most of the applications are being developed by staff working in the line, said Brown. 'And many people are taking the problems home,' he added.

He felt the major benefit of the machine was its low cost which meant that it could be used as a local tool and had 'brought home to people the cost of poor quality'.

Initial production of the Electron was set up in Malaysia and this AB contract means production will be doubled. AB expects to take on 100 new staff in its Rogerstone plant, which is in an area of high unemployment in Wales.



GAFF of the year came from Murray Walker, the TV motor racing commentator, as he was introducing the Electron to the motoring(!) and computer Press.

He launched the machine as Acorn's 'electric computer'. Presumably, he's used to steam-driver calculators.

The reason for the motoring hacks appearing was that Acorn's formula 3 sponsorship was announced at the same time.

US quashes launch doubts

THE BBC micro system was due to be launched to the US Press on October 6 – with Chris Curry flying to New York especially for the event.

This comes after adverse reaction to the company in the *Wall Street Journal* which described the launch as 'a risky step' and quoted a US analyst as saying 'It seems a shortcut to disaster'.

However, Bob Angelo, Acorn's US marketing manager, pooh-poohed the article. 'It's one man's opinion', he said. 'We already have substantial orders, in fact we've got 15,000 systems ordered prior to the launch – not a bad entry for a shortcut to disaster!'

And the prospectus for the launch of Acorn shares claims the company has orders totalling $7 million.

The machine is being aimed straight at the education sector – currently one of the most competitive, with Apple giving machines away to schools in California.

But Harvey Lawner, Acorn Corp's general manager who left Sony to take up the job, is confident. Waving aside the Commodore 64, Tandy and Atari, he saw the Apple IIe and IBM PC as the real competition.

He cited the Econet networking system as the BBC machine's big advantage (standard on the US version) and the amount of software being made available with extensive teachers packs.

The aim is to have 200 packs ready initially, with 40 of these from Britain – mainly from established educational publishers. These will be priced at $50 to $200. Games will come in at about $30. The extra 150 packs have been provided by US publishers, and are mainly licensed versions of established software.

Sales offices have been set up in several states, with about 30 people dotted around the country. The company will also be exhibiting at Comdex in Las Vegas.

The peripherals to the BBC micro system will be offered as they become available, including the second processors. It is planned to import the Electron later on.

Micros will be provided from Acorn's Hong Kong plants, but the US office hopes to set up a US plant within the year.

The second BBC TV series, *Making the Most of the Micro* is now set to follow the first on the Public Broadcasting Service stations.

About 350 dealerships are being established across the States and Canada. 'There will be no mass merchandising', said Lawner, 'Our policy is that the machine has to be supported properly.'

The group is keep to market more British hardware and software. Anyone interested should contact Harvey Lawner at Acorn Computers Corp, 400 Unicorn Park Drive, Woburn, Mass 01801, USA.

Fifth generation move

ACORN has finally gone public, making its two bosses multi-millionaires in the process.

And the new-style company has announced its intention to work on 'fifth generation' computers and play a role in the Government's £300m Alvey programme to encourage high-technology investment.

Acorn's knowledge of the Cambridge Ring high-speed network and VLSI design is seen as an important factor in this.

The next generation of the ring is designed to work at 100MHz with voice and data lines – and Acorn claims to have exclusive rights to the design. Andy Hopper, one of the brains behind the project, is an Acorn director.

The ABM and CAD workstation are expected next year, and a communication device based on the Electron with a built-in telephone link.

Hermann Hauser becomes chairman and Chris Curry managing director after the event. The two have put aside 500,000 shares to set up a charitable trust, presumably to fund their idea for a 'silicon valley' around Cambridge to encourage small companies.

Acorn has opened two new offices, in Cambridge and London. The present 'Waterworks' site will be turned over solely to research.

The company will now be known as Acorn Computer Group plc, and its entry onto the Unlisted Securities market was the biggest the City has seen.

Profits have shot from £3,000 in 1979 to £4m in 1983, against turnovers of £31,000 and £42m.

The share issue was made to finance Acorn's attack on the USA, and the directors expect it to be an expensive process, both in terms of outlay and launch costs.

The Chinese connection

WONG Electronics, which makes the BBC micro in Hong Kong, is negotiating with China to sell the Beeb there.

The Chinese government is evaluating the machine, and the Econet networking system, says Wong's. Computers are in very short supply in China, but scientists and engineers have been concentrating heavily on theoretical aspects, in the expectation of getting hold of machines.

Raymond Yap, the company's European head, has also announced a contract with Acorn to make 50,000 BBC micros for the USA over the next year.

THE ULTIMATE UTILITY ROM

Disc Doctor

This ROM started life as a few disc utility routines. However it has steadily been extended to include very many new commands and features, some of which have nothing to do with discs.

There follows a list of all the commands in this ROM. These can be entered from the keyboard or can be combined into the user's program. They are also accessible from other language ROMs such as WORDWISE.

***DIS**

This is a very powerful disassembler. Special options allow 'offset' disassembly (which makes the disassembly appear to have come from another address), following of jumps and branches and skip calls to the MOS or BASIC. Output can be directed to file or the printer.

***DISCTAPE**

This command will automatically transfer files, machine code and BASIC programs from a disc to tape.

***DOWNLOAD**

Loads a file from tape or disc and moves it to any address. The normal address is &E00 allowing programs to be run on Disc systems without any loss of memory.

***DSEARCH**

Will search the current disc for a string of characters or any sequence of bytes. The search starts from any track. When found the disc editing routine (DZAP) is entered.

***DZAP**

This is a disc editing routine that displays any sector of the disc. The cursor may be moved around the sector and new values can be entered in hex, decimal or binary or as ASCII text

***EDIT**

Displays the contents of any function key for editing, so that long and complicated *KEY definitions do not have to be entered from scratch every time any alteration is needed.

***FIND**

Allows a BASIC program to be searched for any string, such as variable or procedure names, displaying all line numbers in which that string occurs.

***FORM**

Formats blank discs to any number of tracks. Options allow only specific tracks to be formatted. One special option will format discs that can have dual catalogues allowing 60 files per side of the disc.

***JOIN**

This will join one or more disc files together as one file. It may also be used for making copies of any file on the disc.

***MENU**

Typing *MENU or pressing M-BREAK will display a menu of all files on the disc saved under a special directory. Simply selecting one of the menu options will load and run the program.

***MOVE**

Moves a BASIC program from any page to any new page in memory. Amongst many other uses this allows programs on disc machines to be moved to &E00.

***MSEARCH**

Searches memory starting at the given address for any string or sequence of bytes. If the string is found, the area of memory is displayed with the memory editor (MZAP).

***MZAP**

Very much like the disc editor, this displays a window into memory. Once the cursor has been moved to the correct byte, new values may be entered in hex, decimal, binary or as ASCII characters. The window may be scrolled up or down through memory.

***PARTLOAD**

Allows any part of a file to be loaded into memory. This would allow a very large file to be split up into more manageable units.

***RECOVER**

Any number of sectors can be loaded from the disc into memory with this command. Allows the recovery of any data from the disc such as deleted programs etc.

***RESTORE**

The opposite of the above command. Puts back directly onto the disc any section of memory.

***SHIFT**

Used to move any section of memory to any other address.

SWAP

This swaps catalogues on special dual catalogue discs, allowing up to 60 files per side of a disc — almost twice the normal.

***TAPEDISC**

The opposite of DISCTAPE, this will automatically transfer files from tape to disc.

***VERIFY**

Verifies that the disc specified is readable.

This professionally written ROM contains a full help menu giving the syntax of all the commands and is totally compatible with the Acorn DFS.
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Complete with full spiral bound manual and fitting instructions.

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NEW RELEASE!

Termi

A Terminal emulation ROM. This ROM communicates via the RS-423 interface allowing the BBC machine to act as an intelligent terminal to other devices such as Modems, Acoustic Couplers, Mainframe computers, or other BBC machines.

This ROM may be used in several distinct modes — as a 'dumb' terminal so that it will only respond to a limited number of control codes; a custom mode which enables the user to define different defaults for the baud rates, screen modes, parity, etc; a VT52 emulation mode which makes the BBC machine act as a VT52 terminal allowing direct cursor addressing etc. Lastly, a BBC mode in which TERMI will respond to the normal BBC control sequences and so allows the micro to be used as a slave graphics terminal for instance.

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A full specification of this and our range of other ROMS is available from the address below.





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£20 for finding hidden message

SOMEWHERE, hidden in the bowels of this issue is a coded message. We're only giving away one clue, which is that it could be related to the Sound of Music.

Entries marked 'Hidden' should be sent in on a postcard. £20-worth of software goes to the one we pick out of the hat on December 3.

Vampire bugs

IN THE Vampire game (October issue), part of line 1580 has been omitted. The whole line should be:

```
IF INKEY(-72) THEN J%=O:
  YVA%=YVA%+20 ELS
E IF INKEY(-99) THEN J%=O:
  YVA%=YVA%-20 ELSE YVA%=0
```

Also, the program does not work on the 0.1 operating system.

We apologise to readers for any frustration this may have caused.

Chelsea revamp

CHELSEA College has adapted its secondary schools projects for the BBC model B (and Electron) on 40-track disc and cassette.

There are 52 programs in subject areas including biology, physics, chemistry, geography, economics, and history.

Development work is underway in other areas, including English and foreign languages, craft, design and technology and mathematics.

Australian subs

BARSON Computers is to take over servicing Acorn User subscriptions in Australia. Contact Barsons at 335 Johnson Street, Abbotsford, Melbourne, Victoria 3067.

Telesoftware blast-off

THE BBC brought out the big guns for the official christening of its telesoftware service on Ceefax.

Aubrey Singer, TV managing director, and Government industry secretary John Butcher were there to back up Lawson Brown, who heads the service.

As expected, most of programs are aimed at schools, but one interrogated a Consumers Association Ceefax database on cars, giving a taste of what Brown hopes is to come.

Another idea Brown is promoting is to use telesoftware to update programs, for example, tax packages. (However, there are, as yet, no plans to do this for the BBC's own *Taxcalc* package, which could well be out-dated by the next Budget).

Telesoftware uses pages 700 to 706 on BBC1 Ceefax. Page 700 contains an index, 701 the REM newsletter, leaving five pages for programs. Each of these pages has 99 sub-pages linked to it. Hence, in theory about 90k per page could be carried (although this would take 25 minutes to download).

Acorn's £225 teletext adapter, which translates broadcast software on Ceefax so it can be automatically saved in memory by the BBC micro, is now being dispatched. Customers who have ordered it, some two years ago, will be the first to receive the device (and some already have).

The telesoftware filing system (TFS) takes up about 1¼k of memory, and is held in ROM. It acts in the same way as any other sideways ROMs, for example the DFS.

Funding for the service will be provided by the BBC, theoretically from the licence fee. However, the BBC's royalty from sales of the micro and peripherals already runs into millions of pounds, and the Corporation looks as if it will run telesoftware just as it would radio.



BBC micros appear at ITN

THE BBC's aren't the only news rooms where you will find BBC Micros. Our picture shows a thriving user group in the boardroom (no less) of ITN in London. (Various TV awards are displayed on the shelves). Jim Cartwright (standing centre) is the club's chairman, with Tony Martin (right) doing the talking. Thames TV also has an active group.

Several of the group turned up at the *Acorn User* Exhibition, but they left their cameras behind, so we didn't get on the News at Ten.

'Hackers' butt in on live show

THE recent BBC TV live micro show gave an excellent demonstration of how easy it is to break security on an electronic mail system.

As John Coll from the MEP entered his code number and password (and asked the cameras not to look), a message appeared on the screen. This had been left by the 'Hackers' who had illegally entered his 'protected' mailbox on British Telecom's Gold system.

Although no damage was done, it brilliantly complemented clips from *Wargames* shown on the programme. In the film, teenagers access an American military computer and trigger a nuclear confrontation between the super powers.

The show went off with few hitches, although timing was a problem (the clock stopped). David Ellis gave a excellent music demonstration (and is writing a book with Acornsoft on the subject). John Vince of Middlesex Poly demonstrated graphics, including some he did for *Superman III*, and video titling.

Richard Fothergill, head of the MEP, showed off some of the latest software for schools. Lawson Brown defended Ceefax telesoftware against radio broadcasts, such as Radio West's.

Ian Trackman made three software teams sweat to produce an advertising display.

To round it all off, Kenneth Baker, the Government's IT man, was wheeled on to announce the BBC's software competition for schools. There's a total of £32,500 in prizes.

Cumana disc drives hit the High Street

DISC drives will soon be following micros into the major High Street shops, such as W. H. Smiths, says Cumana.

The company has repackaged its slimline drives for retail outlets and will be selling them with formatting disc, cable and manual.

The drives are available in various disc capacities and are fed by their own power supply.

Cumana expects to be selling 10,000 units a month by Christmas, mostly for the BBC micro, although they will also be sold for the Dragon.

Kenda has been working with Cumana on a Winchester disc drive interface which will work with the company's DFS. This was demonstrated in September, but is still under development.

■ SINCLAIR'S ZX printer can now link up to the BBC micro using a £30 interface.

Software in machine code is provided on cassette with instructions. The interface uses the 1MHz bus, and allows standard BBC commands to be used.

Post and VAT included in the £29.95 price, from W. D. Interfaces, 12 Leabank Avenue, Garforth, Leeds LS25 2BL.

■ BEASTY is a servo motor controller designed to introduce Beeb micros to robotics.

Using this device, mechanical apparatus can be controlled from Basic or assembler. Control software for the Beasty takes up 256 bytes of relocatable code.

Commotion market the controller, and a range of servos. The company's address is: 241 Green Street, Enfield, Middlesex.

■ SPEECH synthesis for Atom and BBC Micros is provided by Microtalker at £40.75 (+VAT).

The synthesiser can be programmed in Basic, and comes with amplifier, volume control, speaker and DIN output to hi-fi.

The BBC version operates through the user port with a Basic driver included in programs.

Atom owners make use of the normal printer commands through the printer port.

RPS Electronics, Unit 200 Saltaire Workshops, Ashley Lane, Shipley.

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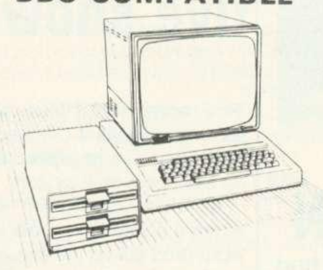
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WATFORD ELECTRONICS

Continued →

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Good Value for Money – Beebug Aug. '83
A very worthwhile package – The Micro User Sept. '83

Without a doubt, the most sophisticated DFS Software yet written for BBC Micro Computer. This powerful new DFS is fully compatible with ACORN DFS yet has much increased power due to additions, carefully designed to make life easier in normal use. It consists of over 14K of efficiently written machine code. It is entirely self contained and so does not require a utilities disc to function.

* The system can either use the ACORN standard 31 files per disc side or DOUBLE THE CAPACITY to 62 files. The size is selected at formatting time. Copying between discs with different catalogue sizes works perfectly normally.
* A FORMATTING PROGRAM is built in, permitting formatting to 35,40,80 track formats with either 31 or 62 files. Since the formatter is built in to the DFS it can be used without affecting whatever program you are using.
* A DISC VARIFIER is also built in. This checks the internal checksums on each sector to identify any corrupted data. This is extremely useful when saving valuable data as it shows faulty discs quickly and easily. Again it does not affect the program you are using.
* A built in DISC SECTOR EDITOR gives a screen window onto the disc enabling detailed editing of any byte on the disc. This is very useful for recovering accidently deleted files and can save weeks of work.
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* A WORKFILE function sets the name to be used when the null filename is issued. This allows a program to be edited and repeatedly saved having only typed its name once.
* When using LOAD, CHAIN, etc. it is possible to specify an ambiguous filename. This will result in the first file whose name matches the specification being used. This saves typing the end of a filename that you know is uniquely identified by its first few characters.
* Two commands exist to simplify the transfer of programs from TAPE TO DISC. These load the file to &1200, switch off the disc system and then move the file to its correct load address; thus saving a lot of complicated programming. This command can be used to load files up to 27K5 long.
* An advanced COPY command is included which will prompt the user, requesting whether to copy each file.
* RENAME has been extended to allow the use of ambiguous filenames. This allows you to change BERT1, BERT2, BERT3 to FRED1, FRED2, FRED3 with only one command.
* OPENOUT has been improved to give you fewer annoying 'Can't extend' errors, as it automatically picks the biggest space on the disc in which to put a file. A SPACE command lets you know how much space *COMPACT could create before you waste time doing it.
* 1.75K of RAM can be taken over from the DFS for your large BASIC programs while still retaining LOAD, SAVE and *CAT and other simple commands.
* Comprehensive and clearly written Manual (available separately) gives the user a complete package deal.

Price: **DFS ROM** ONLY **£42**

Complete interface kit incl. DFS ROM **£85**

Comprehensive and clearly written DFS Manual (can be purchased only when you buy Watford's DFS)
(No VAT) **£7.50**

P.S.
We will exchange your existing ACORN DFS or AMCOM (PACE) DFS for the highly superior Watford's DFS ROM for **£35**

ONLY THE BEST AT WATFORD

BBC FORTH on Cassette
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FREE 70 page manual and a Summary card.

BBC FORTH TOOLKIT
Adds following facilities to FORTH. 6502 Assembler, providing machine-code within FORTH – Turtle graphics enables easy to use colour graphics – Decompiler routines enables versatile examination of your compiled FORTH programs – Full double number set – An example FORTH program and graphics demonstration – Other useful routines – 64 page manual included FREE. ONLY **£13**

LOGO II
This language is very popular in American schools as it is an ideal educational program. It can graphically demonstrate the ideas of defined procedures, sub-routines, loops and even recursive programming. Gives excellent introduction to LOGO language for young and old alike. **£9.95**

Computer Concept's Firmware

BEEB-CALC **£33**

A ROM based spreadsheet program, like wordwise this firmware is fast and simple to use – yet is a powerful spreadsheet analysis program, considerably better than the original 'calc' program – full floating point maths. Works in 40 or 80 column screen modes – variable column widths. Works with either cassette or disc. This ROM coupled with Wordwise can turn your micro into an ideal small business machine.

Wordwise

Without doubt a very sophisticated piece of software for the BBC Micro. It has all the features of a professional word processor yet is easy to use.

SPECIAL OFFER: ONLY **£34**

DISASSEMBLER
Will generate fully labelled assembly listings of any machine code program. Data is automatically differentiated from code and displayed together with its ASCII equivalent. Assembly listing can be saved in *EXEC format and subsequently incorporated into user programs. In our opinion this is an excellent software at an incredibly low price.
Cassette: **£6.95**
Disk: **£8.95**

EMULATOR
An extremely powerful and flexible machine code interpreter. Allows you to write and debug machine code as easily as BASIC. Features single step, breakpoint register display, edit modes, etc.
Cassette: **7.25**
Disk: **£9.25**

VIEW
Acorn soft's Wordprocessor ROM.
The ultimate in Wordprocessing **£52**



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This superb (FIG FORTH) compiling language now available in ROM. Simply plugs into one of the ROM Sockets. Full FORTH manual included. **£39**

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Beebcalc Spreadsheet Analysis	£17.25
Beebplot	£17.25

N.B. All the above Gemini software is on tape. For Disc Based (40/80 track) please add £3.

BOOKS (No VAT on Books)

30 Programs – BBC Micro	£4.95
30 Hour BASIC (BBC Micro)	£6.00
6502 Application Book	£10.25
6502 Assembly Lang. Programming	£12.50
6502 Assembly Lang. Subroutines	£11.80
6502 Software Design	£10.50
A young persons guide to BBC Basic	£4.50
ACORN ATOM Magic Book	£5.50
Advanced 6502 Interfacing	£10.95
Assembly Lang. Programming for BBC	£8.95
Advanced Programming Techniques for the BBC Micro	£7.95
Advanced Programming Techniques for the BBC Basic	£7.95
Assembly Lang. Prog. on BBC Micro	£7.40
BASIC Programming for BBC Micro	£5.95
BBC Forth	£7.50
BBC Lisp	£7.50
BBC Micro An Expert Guide	£7.50
BBC Micro Graphics and Sound	£6.95
BBC Micro ROM PAGING System Explained	£2.95
BBC Micro Revealed	£7.95
BBC Micro Instant Machine Code including Software Cassette	£34.00
Creative Adventure Programs on BBC Micro	£6.95
36 Challenging Games for the BBC Micro	£5.95
Creative Graphics Cassette (Acornsoft). Has 36 graphics programs	£8.95
Creative Graphics on BBC Micro	£7.50
Discover BBC Machine Code	£6.95
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FORTH Programming (Sams)	£12.50
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Games on your BBC Micro	£2.95
Games BBC Computer can Play	£6.95
Getting Acquainted/Acorn ATOM	£7.95
Graphs & Charts on BBC Micro	£7.50
Intro to Micro Beginners Book (3 Ed.)	£9.90
Let your BBC teach you to program	£6.75
Micros in the Classroom	£4.90
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Programming the 6502	£10.75
Programming the BBC Micro	£6.95
Logo Programming	£8.95
Mastering VISICALC (Sybex)	£11.95
Structured Prog. with BBC BASIC	£9.50
The BBC Micro Book, BASIC, SOUND & GRAPHICS	£7.40
The Complete Programmer	£5.95

BBCSoft makes its million

BBC Enterprises claims to have taken orders worth £1m for software since the release of its first package last year. And more is on the way.

After last month's announcement, there are two more cassettes available, both with books. *Beyond Basic* is a tutor on assembler by the NEC (£7.25, book extra at £11.50), and *Toolbox* is a compilation of 20 programming aids by Ian Trackman (£21 including manual).

Other books and software are underway, including titles on music, motoring and simple Basic for schools. A spreadsheet package Ultracalc will be put out in ROM, although there are still no plans to put software onto disc.

A version of Forth is expected, a games generator, and a war strategy program linked to a board game version of the Battle of Waterloo.

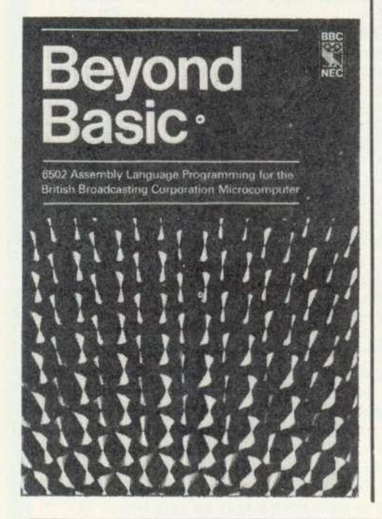
The BBC 'is keeping a careful eye on the Electron', says software editor Meyer Solomon, but no programs have been converted yet.

Several education projects will be linked to TV, telesoftware and radio including a computer literacy scheme for very young children, and an advanced geography package.

All the packs come with booklets (even the games), and the BBC is very much selling its products on the quality, and the level of documentation.

The BBC parries criticism of its earlier launches by explaining that the programs had to be written to run on a model A, which obviously limited them.

A brochure has been printed describing the BBCSoft range, and future plans. BBC Publications, 35 Marylebone High St, London W1M 4AA.



TV programs

TWO series of the BBC TV schools programme *Science Topics* are scheduled to be broadcast which make extensive use of graphics generated by the BBC micro.

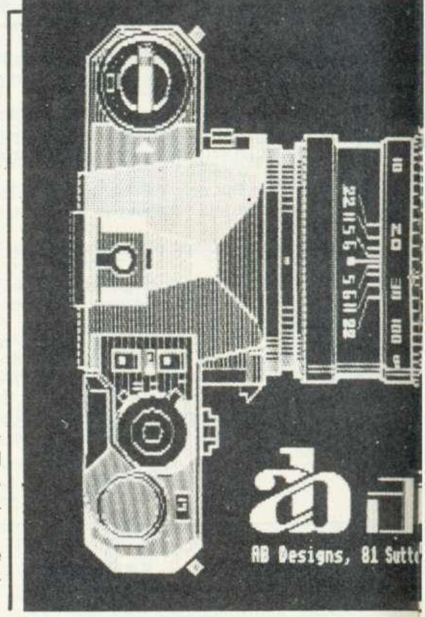
Producer Peter Blatt explained that Ian Trackman (seen on the recent live micro show) had used a 6502 second processor for some of the pictures. He was also developing programs to go out on Ceefax and telesoftware – with cassette versions available next year.

The first new series (which actually contains some repeats) started in September and the second begins in January.

BBC micros are used to produce animated pictures to explain ideas such as waves, genetics, kinetic theory and atomic bonding.

Blatt sees a great future for micros in schools programmes, and hopes to get hold of a 16032 processor to support even more ambitious graphics.

One major package will simulate a Nasa shuttle launch to demonstrate the laws of motion



Bank on your micro

MIDLAND, the listening bank, is about to start listening a bit harder – with the help of your micro.

An experiment is now underway which allows BBC micro owners to connect up to a computer and access information through a modem over the telephone system.

Six services are being offered: the ability to check your balance; examine all entries made on your account since the last statement; order a cheque or statement; refer to financial information; check standing orders; enquire about cheques and credits.

Most of these services are available 24 hours a day, seven days a week, but the last mentioned above, and more detailed facts on standing orders are only available from 8am to 6.30pm. The reason for this is that the simpler services are dealt with by a mini, whereas the more detailed ones need a mainframe.

The experiment involves a 'limited number of customers' and will be based in London. A spokesman explained it was taking place in London because the computer could be accessed by a local call.

'We have no experience of this and therefore we have only a limited idea of how many people we can cope with. It depends on how often people use it,' he said.

He added that the bank had received many more enquiries than expected, with several coming from outside London.

The bank will not be providing any hardware or software, but as long as the customer has a means of accessing a viewdata service through a modem (eg Micronet or Viewfax) they can take part in the experiment.

The scheme is being run on a private viewdata system maintained by the Midland. It does not use Prestel because the bank does not want personal information held on



Prestel. 'However', the spokesman added, 'we haven't ruled out Prestel and may well yet use the Gateway system.'

On the subject of security, the bank was tight lipped, only saying that it met IBS3. This means users must phone in, are asked to key in a number and then a personal password which can be changed daily.

'We believe we're pretty secure,' said the spokesman. 'Even if anyone got through IBS3, they still wouldn't be able to get any personal information out, as there's then another level. And I won't go into that.'

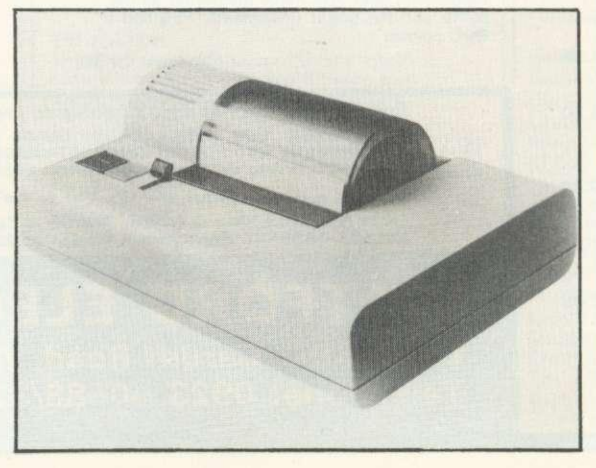
Although this is the first experiment of its kind in Britain, extensive work has been done elsewhere, especially Germany. Their system allows transfers and payments – so you can watch your account being instantly debited! It is all run on the German Prestel and has been in action since 1981.

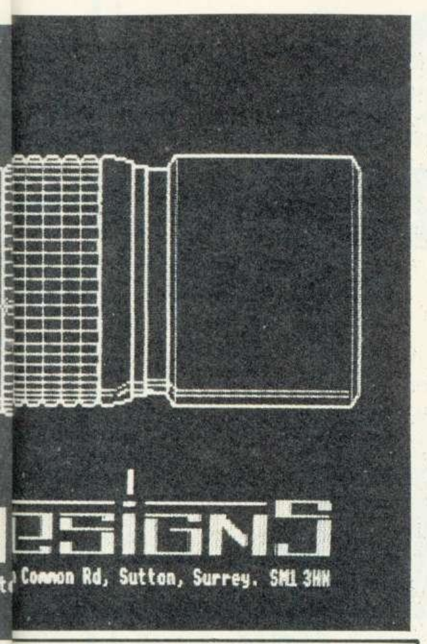
Anyone who joins the trial will receive instructions and password from the bank, but, their spokesman stressed, they will not be doling out BBC micros.

Hot printer

THIS 40-column printer has a Centronics interface and uses a thermal print mechanism developed by Olivetti. It prints at two lines per second, and will dump graphics with a resolution of 320 dots per line.

Replacement paper rolls cost £15 for a box of ten, each 40 metres long. The printer itself costs £149.50 including a separate power pack and BBC Centronics interface module. This includes VAT and postage from Dean Electronics, Glendale Park, Fernbank Road, Ascot, Berkshire.





Draw art on screen for prizes

MICRO GALLERY is a new feature of *Acorn User*. What we want is for readers to send in art and graphics which they've developed on their micro. The best ones will be printed, and prizes given.

You can use a graphics package such as the ones shown on our news pages, or in the reviews from June's issue, or just the built-in commands on your micro.

Entries are best submitted as colour transparencies, and a cassette containing the program should be included. Please explain how your picture was prepared, and which graphics package, if any, was used.

The picture on the left was produced on the AB Designs' package by its author and was first seen at the *Acorn User* Exhibition. The package was reviewed in June's issue and is now available on disc.

There will be three prizes consisting of software to the value of £30, £20 and £10. These will be awarded on two criteria: the technical excellence of the entry and its artistic content.

The judging panel will be made up of *Acorn User* staff.

Please ensure entries are well protected from postal damage, and ensure you enclose a sae if the submission is to be returned. Mark the envelope 'Micro Gallery' to help us sort them out.

Colour dumps and interface

THE BX80 printer will dump all BBC micro modes using seven colours. It is supplied with a colour screen dump listing.

A lead connects to the RS423 port, and the printer has an internal 2.5k buffer (two pages in mode 7).

Speed is 125cps for single colour listing and the BX80 is claimed to be 'low cost' at £495 (+ VAT). Details from Integrex in Burton-on-Trent.

Epson repairs

EPSON distributor Northamber has set up a service centre for out-of-warranty repairs, interfacing and technical information.

The centre is based in Tolworth, Surrey, and is staffed by five engineers. A two-day turn round is promised for most jobs, and an extended warranty is being offered. Details on 01-390 6166.

Religious tapes

AMONG the more unusual groups producing software for the BBC micro is Microcomputers in Religious Education.

MIRE is an association formed to help those using or wanting to use micros to teach RE in schools, colleges or Sunday schools.

MIRE has three software packages on either disc (£10) or cassette (£5). 'Across the School' provides RE work for various age groups while a games pack includes the intriguingly named 'Angels and Demons'.

A simulation 'Church Growth' examines factors affecting the role of the church in today's society.

The company caters for all denominations and publishes a calendar detailing church computing events.

A conference on 'Religion and the Computer' is being held next April at Bradford University. Details are available from MIRE at the address given below.

Religion and the Computer is also the title of a booklet authored by Colin Price. MIRE is at Red Holt, Hainworth Wood, Keighley, West Yorkshire.

Simon Berry looks at defining Spanish accents, and sends his contribution all the way from the Dominican Republic

SPANISH EYES

WHEN producing programs in a foreign language, variations in the character set cause problems. In Spanish it is useful to be able to produce the characters:

á, é, í, ó, ú, ñ, ¿

These can, of course, be user defined, the code for "¿" being:

VDU23, 240, 24, 0, 24, 24, 48, 102, 60, 0

Rather than use the normal ASCII codes 224 to 255, reserved for user defined characters, the codes set aside for the teletex control codes can be used, to great advantage. These are set up by the procedure below.

Using this procedure as a part of the computer's initialisation program, the SHIFT <f-key> from f0 to f7 returns the above character set directly, while writing to the screen, in modes 0 to 6.

Obviously, before running a program written in this way, the codes must first be defined, and this can be done by including the procedure listed, at the beginning of each program, before output is sent to the screen.

This principle could be applied to other languages. I have no experience with printers and so do not know how the above would apply to output sent to a printers. Perhaps someone could entlighten us?

```
    5 MODE4
   10 PROC_spanchar
   20 FOR X=128 TO 135
:PRINTCHR$(X):NEXT
   30 END
 5000 DEFPROC_spanchar
 5010 VDU23,128,12,24,
60,6,62,102,62,0
 5020 VDU23,129,12,24,
60,102,126,96,60,0
 5030 VDU23,130,12,24,
56,24,24,24,60,0
 5040 VDU23,131,12,24,
60,102,102,102,60,0
 5050 VDU23,132,12,24,
102,102,102,102,62,0
 5060 VDU23,133,124,0,
124,102,102,102,102,0
 5070 VDU23,134,24,0,2
4,24,48,102,60,0
 5080 VDU23,135,24,0,2
4,24,24,24,24,0
 5090 ENDPROC
```

IMPOSSIBLE PROBLEMS

Stan Froco cites the knapsack and travelling salesman as examples of computer beaters

MANY people think all problems can be solved by computer if you can only express them as a program. However, there is a set of problems that can never be solved by computer in a reasonable time (say the estimated life of the universe). No matter how fast computers go there will always be a problem in this set that cannot be solved. For rather complex mathematical reasons these are known as 'NP-complete' problems. An example may help here: The Travelling Salesman Problem.

A salesman is told to visit each state capital in the USA. He is warned that petrol is expensive and so he must use the shortest route possible. How does he work out the shortest route, starting and finishing at a given capital?

There would seem to be an obvious way to solve this problem—just try all possible combinations of capitals and choose the shortest route. Easily done by computer in about five lines of Basic. The trouble is there are quite a few possible combinations. There are 50 ways of choosing the first city on the route. For each of these there are 49 possibilities of a second city. For each of these there are 48 possible third cities, and so on. This comes to:

50*49*48* ... *3*2*1 combinations

or approximately: 30,000,000,000,000,000, 000,000,000,000, 000,000,000,000,000,000, 000,000,000,000,000,000 combinations. Even if we used a supercomputer capable of trying a thousand million combinations a second this would still take about: 200,000,000,000,000,000,000,000,000,000, 000,000,000 times the age of the earth. Clearly, this is not going to be any use to our salesman, but nobody has yet found a better way. It is thought no better solution exists, but this cannot be proved.

However, computers do have their uses with these problems. Although we cannot give an exact answer, it is often possible to give an approximation. Very often we can say how bad an approximation it might be in the worst case (as in the example that follows). In practice, such solutions are as valuable as knowing the exact answer.

The example I am going to show solves a problem which, like the travelling salesman, cannot be solved exactly in a reasonable time. It's a derivative of The Knapsack Problem.

You have to take a lot of things on a walking holiday, all in one knapsack. Not everything will fit in, so you decide to take as much as possible. You need to decide which items to take to minimise the amount of empty space in the knapsack.

To get an exact answer means using the same method as with the travelling salesman. Take all possible combinations, try putting them in the knapsack and choose the one which wastes the least room.

This is a messy example because you have to allow for fitting items together which have bits sticking out and so on. This is not difficult, but confuses the issue. I shall simplify the problem, and in so doing give a program which may have a use for the small businessman.

The Stock Cutting Problem: you are a supplier of steel bars with stock in the form of hundred metre long bars, which must be cut to length. You have a large number of orders, and want to ensure that each time you cut up a stock bar, the bit left over that is too short for use, is as small as possible. (This is exactly the same as filling a one-dimensional knapsack.)

Program 1 shows a simple way of deciding how to cut up a steel bar. It uses the 'greedy algorithm' (an algorithm is a set of instructions for solving a problem). All the orders are held in an array called orders% and sorted in decreasing size. We keep cutting the biggest order that will fit off the remaining piece of bar. This may give a very bad approximation. Imagine we had orders for pieces of steel of lengths: 51m, 50m and 50m.

We would cut off 51m and nave 49 left of no use, when obviously we should have cut off two pieces of length 50m. A waste of 49m when it should have been 0m. This is however the worst case, and we can guarantee there will be never more than 50m more waste than there should have been. In practice, if there are a lot of orders the error is much smaller.

There is a better approach illustrated in program 2. Here we consider taking each order in turn as the first cut, and then using

the greedy algorithm to cut up the rest of the bar. We then choose the one that gives least waste. This is much slower than the first program (we effectively run the first program once for each order there is). Lines 170 to 230 select each order as the first cut. The order in question is set to 101m to stop it being used again by PROCgreedy. PROCgreedy is extended to take a second argument, prflag%. It will only print out the cutting sequence if prflag% is true. This is so PROCgreedy can be used while trying out the various possibilities to find the best. The difference this time is that the worst case is if we have orders of steel bars of length: 35m, 34m, 33m, 33m.

In general this program gives better guesses, and we can say the worst case will not give a wastage more than 33m bigger than it should be.

The program can be extended an arbitrary number of times by taking all combinations of two orders first and then using the greedy algorithm, with three orders first and so on. Each refinement slows the program an order of magnitude, but improves the worst case performance.

Many other problems turn out to be NP-complete and need approximate solutions. Approximate methods are often very valuable for other types of problem, which while not NP-complete take an unacceptable length of time to solve.

I have again been asked to recommend a book to go with this series of articles. Unfortunately, there are not many suitable books available. *Data Structures and Algorithms* by Aho, Hopcroft and Ullman, published by Addison-Wesley is about the best, but is rather more advanced in its approach, and may make heavy reading for the novice, particularly since the examples are in Pascal. *The Art of Computer Programming* by D. E. Knuth, again published by Addison-Wesley, is probably the definitive work, but is extremely mathematical and hard work even at university level. It also costs about £50 for all three volumes. Many books exist on programming techniques for the Atom, BBC micro and Electron, but those I have seen are compendia of programming tricks and system information, and really don't cover general programming techniques. There is a very strong need for an introductory book in this area.

One book that is relevant to this particular article is *Goedel, Escher, Bach—an Eternal Golden Braid* by Douglas Hofstadter (Harvester Press). This won't teach programming, but gives an insight into some of the more fundamental problems of computer science. ●

```
 10 REM*****************************************************************
 20 REM
 30 REM    Simple solution to the stock-cutting problem
 40 REM
 50 REM*****************************************************************
 60
 70 numobj% = 10   :REM The number of orders
 80 DIM orders%(numobj%)
 90 FOR i% = 1 TO numobj%
100 READ orders%(i%)
110 NEXT
120
130 length% = 100   :REM The length of the bar to be cut
140
150 PRINT "Stock bar is length " ; length% ; " m"
160 PRINT "Cut the stock as follows:"
170 waste% = FNgreedy(length%)
180 PRINT "Amount wasted " ; waste% " m"
190 END
200
210 REM The orders
220
230 DATA 27,24,21,18,18,17,12,8,7,6
240
250 REM*****************************************************************
260 REM
270 REM    Use the greedy algorithm to decide the cutting procedure
280 REM
290 REM*****************************************************************
300
310 DEF FNgreedy(loclen%)
320 LOCAL i%
330
340 FOR i% = 1 TO numobj%
350 IF orders%(i%) <= loclen% THEN loclen% = loclen% - orders%(i%) :
     PRINT "    a piece of length " ; orders%(i%)
360 NEXT
370 = loclen%
```

Program 1. Simple solution uses greedy algorithm

```
 10 REM*****************************************************************
 20 REM
 30 REM    Better solution to the stock-cutting problem
 40 REM
 50 REM*****************************************************************
 60
 70 numobj% = 10   :REM The number of orders
 80 DIM orders%(numobj%)
 90 FOR i% = 1 TO numobj%
100 READ orders%(i%)
110 NEXT
120
130 length% = 100   :REM The length of the bar to be cut
140
150 leastwaste% = length% + 1   :REM The least amount it is possible to waste
160
170 FOR i% = 1 TO numobj%   :REM Try each order as the first one
180 first% = orders%(i%)
190 orders%(i%) = length% + 1   :REM So won't be used again
200 waste% = FNgreedy(length% - first%, FALSE)   :REM Don't print out
210 IF waste% < leastwaste% THEN leastwaste% = waste% : best% = i%
220 orders%(i%) = first%
230 NEXT i%
240
250 PRINT "Stock bar is length " ; length% ; " m"
260 PRINT "Cut the stock as follows:"
270 first% = orders%(best%)
280 orders%(best%) = length% + 1   :REM So won't get used
290 PRINT "    a piece of length " ; first%
300 waste% = FNgreedy(length% - first%, TRUE)   :REM Will print out
310 PRINT "Amount wasted " ; waste% " m"
320 END
330
340 REM The orders
350
360 DATA 27,24,21,18,18,17,12,8,7,6
370
380 REM*****************************************************************
390 REM
400 REM    Use the greedy algorithm to decide the cutting procedure
410 REM
420 REM*****************************************************************
430
440 DEF FNgreedy(loclen%, prflag%)
450 LOCAL i%
460
470 FOR i% = 1 TO numobj%
480 IF orders%(i%) <= loclen% THEN loclen% = loclen% - orders%(i%) :
     IF prflag% THEN PRINT "    a piece of length " ; orders%(i%)
490 NEXT i%
500 = loclen%
```

Program 2. Better solution to stock-cutting problem

YOUR PARENTS DID THEIR BEST FOR YOU...WILL YOUR CHILDREN BE ABLE TO SAY THE SAME?



"Now...I've got two oranges in my left hand and one in my right, how many oranges...?"

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A PARENTS' HANDBOOK IS INCLUDED IN EACH PACKAGE, CONTAINING SIMPLE OPERATING INSTRUCTIONS AND A STEP-BY-STEP GUIDE TO HELP YOU AND YOUR CHILD GET THE BEST OUT OF EACH PROGRAM. IT ALSO CONTAINS A WEALTH OF FOLLOW-UP ACTIVITIES FOR YOU BOTH TO ENJOY AWAY FROM THE COMPUTER.

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PUT YOUR HOME COMPUTER TO WORK FOR YOUR CHILDREN NOW. SEND FOR YOUR GOOD HOUSEKEEPING EARLY LEARNING PACKAGES BY CUTTING THIS COUPON.

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IMPROVE YOUR CONTOURS

Mike Fryer outlines two programs to plot contour maps of curves. The first will run on a model A

HAVE you ever tried to work out the shape of a three-dimensional surface from its equation? It's not as easy as it might sound – and even a simple-looking function is very awkward to draw. Take the equation Z=XY, where Z is the height above the X-Y plane. It describes the 'saddle' shape shown in figure 1, but you've got to be quite a good artist to make it look convincing. There's another drawback to a three-dimensional plot – because it's drawn as a perspective view, the scales can be misleading.

One way round this is to draw a contour



map. To do this, we 'slice' the surface parallel to the X-Y plane, the edges of these sections forming contours (figure 2). The contour value of a section corresponds to its height above the X-Y plane – the Z value. A set of such contours gives a good idea of the surface and doesn't destroy the Z scale.

The contour map of Z=XY in figure 3 (with Z=−4,−2,0,2 and 4) shows that the function takes high values (Z>4) at the top right-hand corner (X and Y both positive), decreasing to zero at the centre, and increasing again as it moves to the bottom left-hand corner (Z>4 and both X and Y negative). On the other diagonal, we see that Z starts negative (Z<−4), increases towards the centre (Z=0) and decreases again in the opposite corner. The centre is a 'saddle' point. As with ordinary maps, if the *values* of the contours are equally spaced then 'bunching' suggests a steep slope, whereas well-spread contours indicate a more gentle incline. So, close to the centre of our picture the surface is reasonably flat, becoming progressively steeper towards the corners.

Having convinced you (I hope!) that contour maps are a good idea, how can we set about making the computer plot them for us? Let's look at the function Z=XY over the values of X and Y used in figures 1 and 2Y(−4<X<4,−2<Y<2). The corresponding range of Z values is from −8 to 8, giving the range of possible contour values we could plot. Now, suppose we wanted to plot the contour with value 1, how could we set about it?

The simplest and crudest method is to compare the value of the function with that of the contour (1) at each of a 'grid' of points covering the range of X and Y values of interest – if the function is less than 1 print '0', else print '1'. The grid of points may well be 40 in the X direction and 25 in the Y direction, corresponding to the positions of the characters in mode 7, although I've only used a 24-square grid in figure 4. A crude, but nevertheless recognisable contour can be seen as the boundary between the 0s and the 1s. A print-out and the use of a felt-tipped pen soon make it more acceptable. It's easy to extend this to plot several contours. Program 1 will print up to eight contours using the numerals 0 to 9 to separate the contours. One benefit of this type of plot is that it can be run in mode 7 and doesn't use much space, so it's ideal for the model A.

However, besides the poor plot quality, there is another drawback – it's impossible to add extra contours without re-drawing the whole function. This could be overcome if the program just drew the contours: our next task.

The most practical answer is to use 'linear interpolation'. First, assume we've evaluated the function at each of a grid of points. Now look at each square of the grid in turn: if the function is less than the contour value at all four corners, it is reasonable to assume the contour doesn't

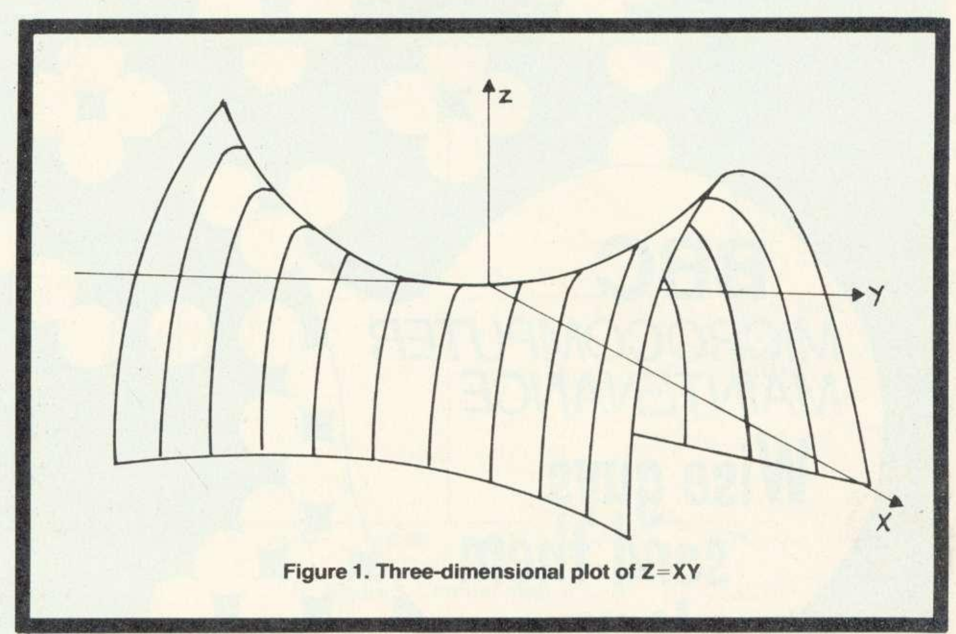


Figure 1. Three-dimensional plot of Z=XY

Figure 2. The 3D surface with its contour map

pass through that square, similarly if they are all greater than the contour value. If, however, some function values are greater than that of the contour, whilst some are less, the contour must pass through that square.

Suppose we have the situation in figure 5, and we are looking for the 1 contour as before, then obviously it must pass between A and D and between B and C. Since we have no more information (without evaluating the function further), we can only estimate these crossing points. Since 1.1 is nearer to 1 than 0.5, we assume the contour will pass nearer D than A. We estimate this crossing to be at E where AE/AD=(1−0.5)/(1.1−0.5), ie AE=5*AD/6. This is an example of linear interpolation. Similarly, point F on BC is calculated by BF/BC=(1−0.9)/(1.2−0.9) which gives BF=BC/3. We now plot the line EF as our approximation to the contour through this square. This routine is repeated for all the squares.

If there are enough squares in the grid we can get a very good approximation to the contour map. Even with a relatively small number of squares quite a useful contour map can be formed, although any poor interpolation stands out clearly. Look for example at figure 6 – presumably there are two contours passing through this square, but how can the computer decide which pairs of points to join? One answer is to subdivide the square and use linear interpolation on each of these sub-squares. There are other methods, including those which require the function to be evaluated at further points. Of course, the same difficulty might occur in one of these sub-squares, so a recursive use of this subdivision procedure should be allowed, at least until the sub-squares are small enough not to matter.

Program 2 uses these techniques to plot contours in mode 0, using a 20 by 20 grid. This mode was chosen to allow for a text window (15 characters wide) on the right of the plotting area for messages to be displayed, and contour values to be input. This program has other features: several functions can be superimposed, contours can be generated automatically and/or specific contours plotted, and axes labelled – all during run-time.

Program 1 uses mode 7 and is (page 29) for models A and B. The function of X and Y to be plotted is input as a string (line 30), together with information about the ranges of both variables (lines 40-100). The function is evaluated in PROCFUNC (lines 310-430) using EVAL: its values at each of the 24 by 24 grid points are stored in the two-dimensional array F for future use. The minimum and maximum values in this array are next output to show the range of possible contour values.

The user is asked whether the contours are to be selected automatically (PROCAUTO) or manually (PROCSPEC). In the first case the number of contours (up to nine) is requested, and in the second the

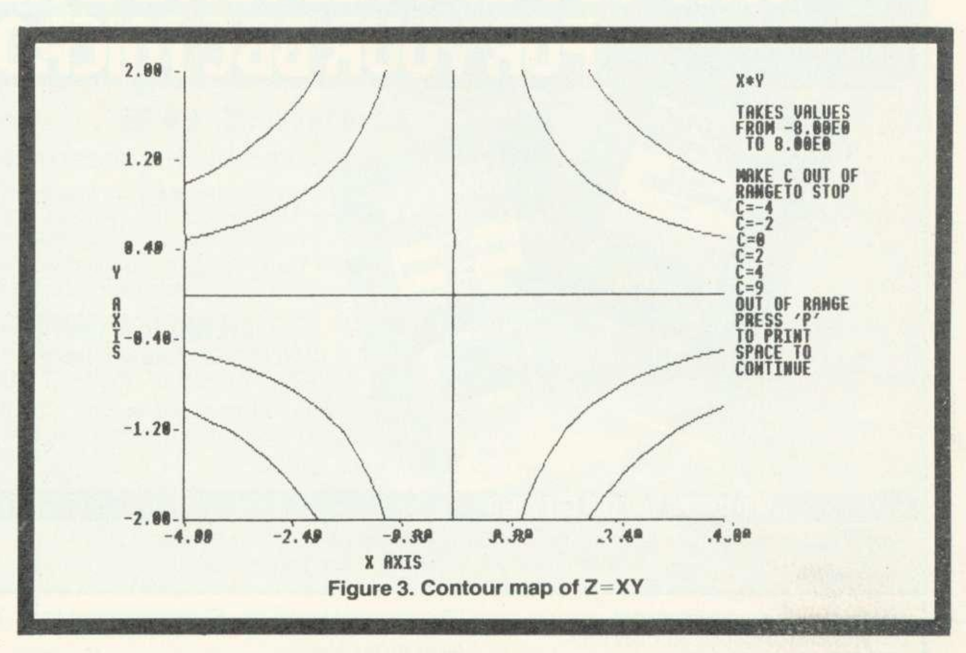


Figure 3. Contour map of Z=XY

```
TYPE IN A FUNCTION OF X AND Y
?X*Y

X AXIS

MINIMUM VALUE?-4
MAXIMUM VALUE?4

Y AXIS

MINIMUM VALUE?-2
MAXIMUM VALUE?2

THE FUNCTION TAKES VALUES
FROM  -8.00000001
 TO  8

AUTOMATIC CONTOUR SELECTION (Y/N)?N
ENTER CONTOUR VALUES IN ASCENDING ORDER
(MAKE OUT OF RANGE TO STOP)
CONTOUR VALUE 1?1
CONTOUR VALUE 2?10


2        000000000000011111111111
         000000000000001111111111
         000000000000001111111111
         000000000000001111111111
         000000000000001111111111
         000000000000000111111111
         000000000000000111111111
         000000000000000011111111
         000000000000000001111111
         000000000000000000011111
         000000000000000000000001
         000000000000000000000000
         000000000000000000000000
         100000000000000000000000
         111110000000000000000000
         111111100000000000000000
         111111110000000000000000
         111111111000000000000000
         111111111000000000000000
         111111111100000000000000
         111111111100000000000000
         111111111100000000000000
         111111111100000000000000
-2       111111111110000000000000
         -4                     4>
```

Figure 4. Program 1 produces crude but recognisable contour defined by border of two values

user must supply contour values in ascending order – any value out of range will end the list. Lines 170-280 check each grid square in turn, PROCCHAR supplying the corresponding character to be printed. A '0' is printed for a function value less than the first contour value, a '1' for a function value between the first and second contour values, etc. The highest and lowest values for both the X and Y variables are also printed.

Note: If space is at a premium, the function could be evaluated twice rather than stored in the array F. The modifications for this are as follows:

Line 20: delete ,F(23,23)
Line 250: replace F=F(I%,K%) by F=EVAL(F$)
Delete line 410.

Program 2 (page 29) is similar to program 1, although it uses mode 0 so it is only suitable for a 32k machine. Input of the functions to be plotted – one main function, and up to nine subsidiary functions that can be superimposed – comes first (lines 10-80). A call to PROCDATA then asks for information regarding the ranges of values for X and Y. This procedure calls PROCFUNC which evaluates the current function at each of the 21 by 21 points of the grid, storing the values in the two-dimensional array F. The largest and smallest of these values are output to enable sensible contour values to be used.

A text window is set up in mode 0 (line 130), then the axes are plotted and labelled (PROCAXES). The text window is used to supply and request information regarding the contours to be plotted. If the automatic contour selection procedure (PROCAUTO) has not been called, then 'C=' prompts the user to supply the next contour value – an out-of-range value ends the plotting of the current function. (If a printer routine is to be used it could be called from line 310.) After a contour value has been selected, the corresponding contour is plotted (lines 240-280). Each grid square is considered in turn and examined for the presence of the contour (PROCSQU). If necessary, a square can be subdivided by PROCDIVIDE (itself calling PROCSQU) an example of the recursive use of procedures. Finally the interpolated line is plotted.

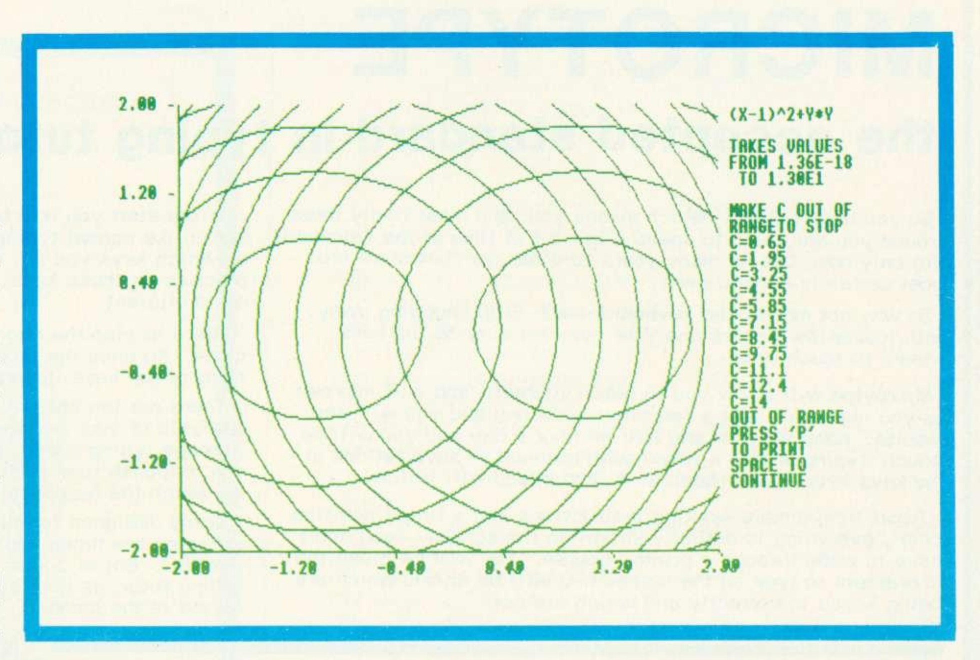
The same routine is then followed for each of the subsidiary functions in turn.

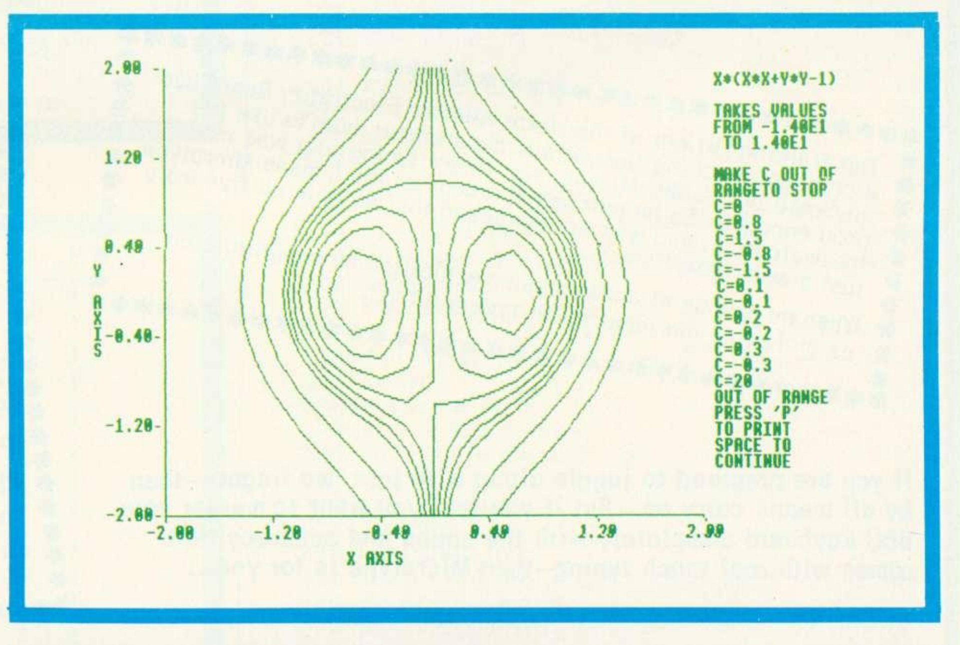
Note: The program assumes it is loaded at the usual PAGE setting (&E00). If a disc system is in use and it is inconvenient to reset PAGE, the following modifications could be made:

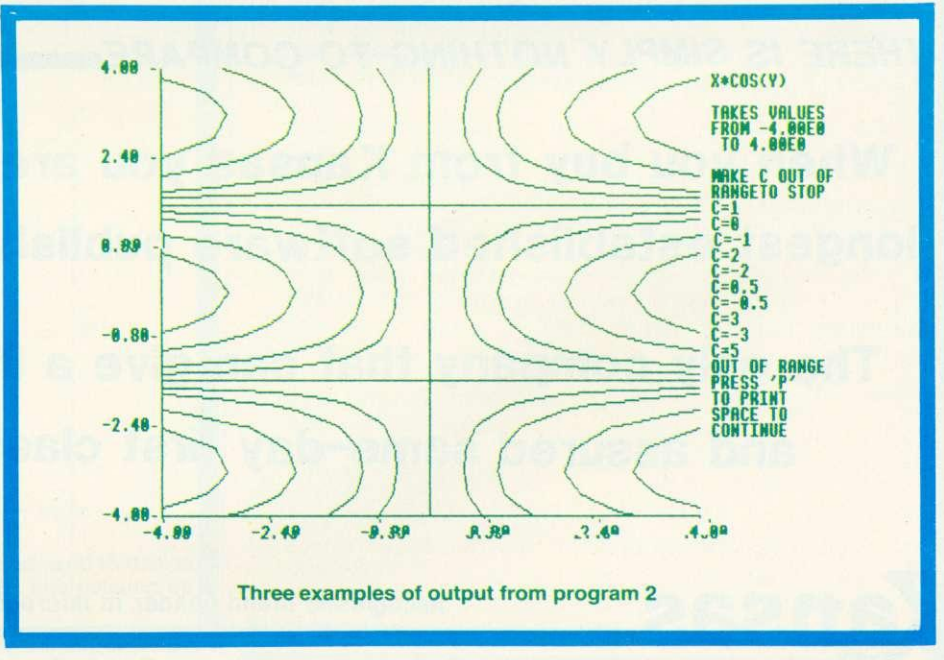
Line 20: replace F(20,20) by F(12,12)
Line 810: replace B%<4 by B%<2
Line 940 is replaced by
N%=12:M%=12

This will of course, result in a slightly poorer quality contour map. ●

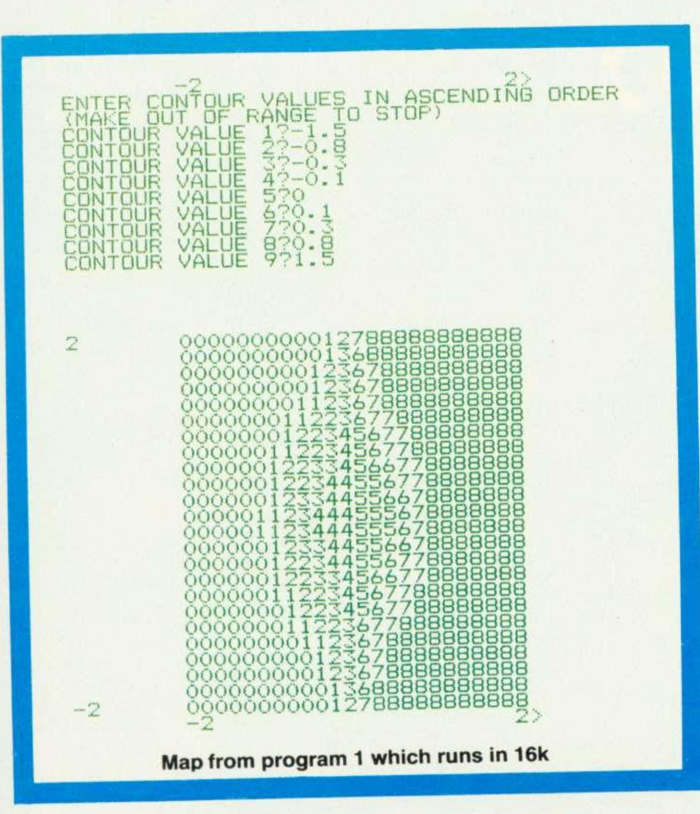
Programs 1 and 2 with Figures 5 and 6 are on pages 29 and 32 ▶







Three examples of output from program 2



Map from program 1 which runs in 16k

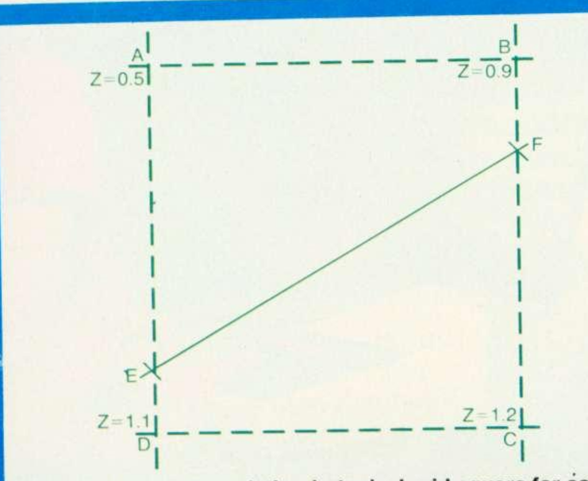


Figure 5. Linear interpolation in typical grid square for contour with value 1

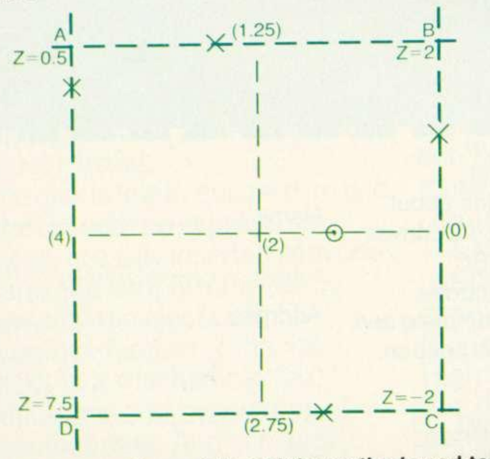


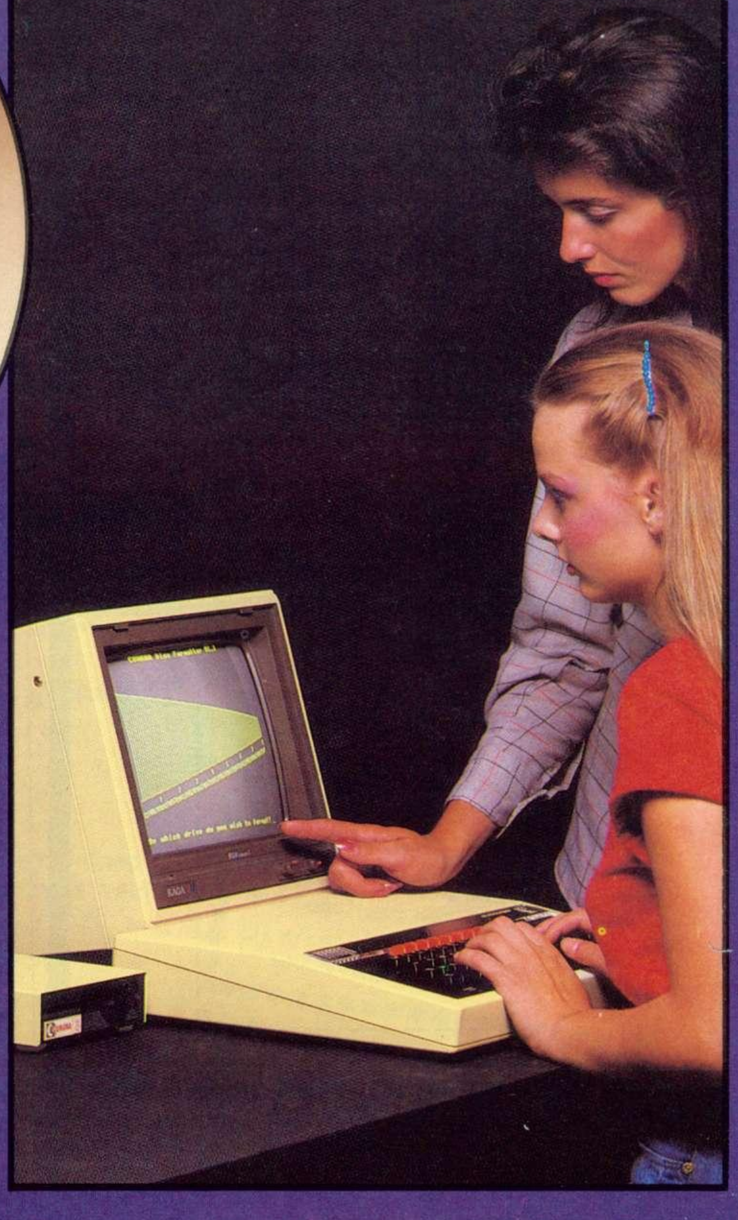
Figure 6. Four crossing points and the method used to decide which to join. (Circled points is estimated by interpolating on the edges of the sub-squares.)

```
  10 REM PROGRAM 1 M.J.FRYER 3-3-83
  20 DIM C(9),F(23,23)
  30 MODE7:CLS:INPUT'"TYPE IN A FUNCTION OF
X AND Y"',F$
  40 PRINT''"X AXIS"
  50 INPUT'"MINIMUM VALUE",XMIN
  60 INPUT"MAXIMUM VALUE",XMAX
  70 PRINT'"Y AXIS"
  80 INPUT'"MINIMUM VALUE",YMIN
  90 INPUT"MAXIMUM VALUE",YMAX
 100 IF XMAX<XMIN OR YMAX<YMIN GOTO40
 110 DX=(XMAX-XMIN)/23
 120 DY=(YMAX-YMIN)/23
 130 PROCFUNC
 140 PRINT'"THE FUNCTION TAKES VALUES"'"FROM
 ";FMIN;'" TO  ";FMAX
 150 INPUT'"AUTOMATIC CONTOUR SELECTION (Y/N
)",ANS$
 160 IF ANS$="Y" THEN PROCAUTO ELSE PROCSPEC
 170 Y=YMAX+DY
 180 PRINT;YMAX;TAB(8);
 190 FOR J%=0 TO 23
 200 IFJ%>0 ANDJ%<23 PRINT'TAB(8);
 210 IFJ%=23 PRINT';YMIN;TAB(8);
 220 Y=Y-DY:X=XMIN-DX
 230 FOR K%=0 TO 23
 240 X=X+DX
 250 F=F(J%,K%):PROCCHAR
 260 PRINT;A%;
 270 NEXT
 280 NEXT
 290 PRINT'TAB(8);XMIN;TAB(31);XMAX;
 300 END
 310 DEFPROCFUNC
 320 X=XMIN:Y=YMIN:FMIN=EVAL(F$):FMAX=FMIN
 330 Y=YMAX+DY
 340 FOR I%=0 TO 23
 350 Y=Y-DY:X=XMIN-DX
 360 FOR J%=0 TO 23
 370 X=X+DX
 380 F=EVAL(F$)
 390 IF F>FMAX FMAX=F
 400 IF F<FMIN FMIN=F
 410 F(I%,J%)=F
 420 NEXT:NEXT
 430 ENDPROC
 440 DEFPROCAUTO
 450 INPUT"HOW MANY CONTOURS",NC%
 460 IF NC%>9 NC%=9
 470 DF=(FMAX-FMIN)/NC%
 480 C(0)=FMIN+DF/2 :PRINT"CONTOUR 1=";C(0)
 490 IF NC%=1 ENDPROC
 500 FOR I%=1 TO NC%-1
 510 C(I%)=C(I%-1)+DF:PRINT"CONTOUR ";I%;"="
;C(I%)
 520 NEXT:PRINT'''
 530 ENDPROC
 540 DEFPROCSPEC
 550 PRINT"ENTER CONTOUR VALUES IN ASCENDING
 ORDER"'"(MAKE OUT OF RANGE TO STOP)"
 560 CM=FMIN
 570  FOR I%=0 TO 8
 580 PRINT"CONTOUR VALUE ";I%+1;:INPUTC(I%)
 590 IF C(I%)<=CM THEN PRINT"INVALID ENTRY":
GOTO580
 600  IF C(I%)>FMAX NC%=I%:I%=8:GOTO620
 610 CM=C(I%):NC%=I%
 620 NEXT:PRINT'''
 630 ENDPROC
 640 DEFPROCCHAR
 650 A%=NC%
 660 FOR I%=0 TO NC%-1
 670 IF F>C(I%) GOTO680 ELSE A%=I%:I%=NC%
 680 NEXT
 690 ENDPROC
```

Program 1. Uses mode 7. Suitable for 16k machines

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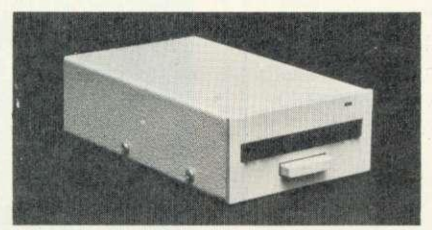
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Program 2. Mode 2 contour plotting. (Remember to take out line 10 for any debugging)

```
    5 REM PROGRAM 2 M.J.FRYER 3-3-83
   10 ON ERROR GOTO 330
   20 DIM XPL(4),YPL(4),F(20,20),A$(10)
   30 I%=1:C3%=0:CLS:PRINTTAB(0,5)"TYPE FUNCTION
 OF X AND Y":INPUT A$(0)
   40 MODE7:CLS:INPUT TAB(0,10)"DO YOU WISH TO S
UPERIMPOSE ANOTHER"'" FUNCTION?(Y/N)",ANS$
   50 IFANS$="N" GOTO 90
   60 PRINTTAB(0,15)"TYPE NEXT FUNCTION"
   70 INPUT A$(I%) :C3%=C3%+1:I%=I%+1
   80 IF I%<10 GOTO 40
   90 MODE 7:CLS
  100 A$=A$(0):C2%=C3%
  110 PROCDATA
  120 MODE0:CLS
  130 VDU 28,65,27,79,1
  140 XS=900/N%:YS=900/M%
  150 PROCAXES
  160 @%=&10309
  170 PRINT A$(C3%-C2%)
  180 PRINT'"TAKES VALUES   FROM ";MIN:PRINT" TO
 ";MAX'
  190 IF NC%>0 DC=(MAX-MIN)/NC%:C=MIN-DC/2ELSE P
RINT"MAKE C OUT OF  RANGETO STOP"
  200 IF NC%>0 PROCAUTO
  210 IF NC%=-1 INPUT"C="C
  220 IFNC%>0 AND C>MAX GOTO 300
  230 IF C>MAX OR C<MIN GOTO 300
  240 FOR J%=0 TO M%-1
  250 FOR I%=0 TO N%-1
  260 B%=0
  270 PROCSOU(C,I%,J%,F(I%,J%),F(I%+1,J%),F(I%+1
,J%+1),F(I%,J%+1),XS,YS)
  280 NEXT:NEXT
  290 GOTO200
  300 REPEAT
  310 IFC2%=0 PRINT"PRESS SPACE BAR TO CONTINUE"
:ANS$=GET$:UNTIL ANS$=" "ELSE CLS:A$=A$(1+C3%-C2
%):C2%=C2%-1:PROCFUNC:NC%=-1:GOTO 170
  320 VDU 4:REMRESET SCREEN
  330 @%=10
  340 CLS:MODE 7
  350 INPUT TAB(0,10) "DO YOU WISH TO PLOT THE S
AME FUNCTION    AGAIN (Y/N)",ANS$
  360 CLS:IF ANS$="Y" GOTO 100
  370 PRINT TAB(0,10)"TO INSERT NEW FUNCTION PRE
SS SPACE BAR"'"TO EXIT PRESS ANY OTHER KEY":ANS$
=GET$
  380 IF ANS$=" " GOTO 30
  390 CLS
  400 END
  410 DEFPROCAXES
  420 LOCAL DX,DY
  430 @%=&20206
  440 DX=(XSTOP-XSTRT)/5:DY=(YSTOP-YSTRT)/5
  450 VDU 5:REM JOIN CURSORS
  460 MOVE1020,100:REM GRAPH IN 1000*1000SQUARE
  470 DRAW 120,100:DRAW 120,1000
  480 FOR I%=0 TO 5
  490 MOVE 120+I%*180,100:DRAW 120+I%*180,90
  500 MOVE 88+I%*180,80:PRINT; XSTRT+I%*DX
  510 NEXT
  520 LX=LEN(LX$):SX=470-LX*8
  530 MOVE SX,30:PRINT;LX$
  540 FOR I%=0 TO 5
  550 J%=I%*180+100:MOVE 110,J%
  560 DRAW 105,J%:MOVE 20,J% +16
  570 PRINT; YSTRT+I%*DY
  580 NEXT
  590 LY%=LEN(LY$):SY%=450+LY%*32
  600 FOR I%=1 TO LY%
  610 MOVE 0,SY%-I%*32:PRINT MID$(LY$,I%,1)
  620 NEXT
  630 @%=10
  640 VDU4
  650 ENDPROC
  660 DEFPROCSOU(C,I%,J%,F0,F1,F2,F3,XS,YS)
  670 LOCAL K%
  680 K%=0
  690 A0%=SGN(F0-C):A1%=SGN(F1-C):A2%=SGN(F2-C):
A3%=SGN(F3-C)
  700 IF ABS(A0%+A1%+A2%+A3%)=4 GOTO870
  710 IF A0%=0 XPL(K%)=I%*XS:YPL(K%)=J%*YS:K%=K%
+1
  720 IF A1%=0 XPL(K%)=(I%+1)*XS:YPL(K%)=J%*YS:K
%=K%+1
  730 IF A0%*A1%=-1 XPL(K%)=(C-F0)*XS/(F1-F0)+I%
*XS:YPL(K%)=J%*YS:K%=K%+1
  740 IF A2%=0 XPL(K%)=(I%+1)*XS:YPL(K%)=(J%+1)*
YS:K%=K%+1
  750 IF A1%*A2%=-1 XPL(K%)=(I%+1)*XS:YPL(K%)=(C
-F1)*YS/(F2-F1)+J%*YS:K%=K%+1
  760 IF A3%=0 XPL(K%)=I%*XS:YPL(K%)=(J%+1)*YS:K
%=K%+1
  770 IF A2%*A3%=-1 XPL(K%)=(C-F3)*XS/(F2-F3)+I%
*XS:YPL(K%)=(J%+1)*YS:K%=K%+1
  780 IF A0%*A3%=-1 XPL(K%)=I%*XS:YPL(K%)=(C-F0)
*YS/(F3-F0)+J%*YS:K%=K%+1
  790 K%=K%-1
  800 IF K%<=0 GOTO 870
  810 IF K%>1 AND B%<4 PROCDIVIDE(I%,J%,XS,YS,F0
,F1,F2,F3):GOTO 870
  820 MOVE XPL(K%)+120,YPL(K%)+100
  830 REPEAT
  840 K%=K%-1
  850 DRAW XPL(K%)+120,YPL(K%)+100
  860 UNTIL K%=0
  870 ENDPROC
  880 DEFPROCDATA
  890 LOCAL F
  900 PRINT TAB(4,5)"X AXIS:"
  910 INPUT"LOWEST VALUE = "XSTRT
  920 INPUT"HIGHEST VALUE= "XSTOP
  930 INPUT"LEGEND ",LX$
  940 N%=20:M%=20
  950 PRINT TAB(4,11)"Y AXIS:"
  960 INPUT"LOWEST VALUE = "YSTRT
  970 INPUT"HIGHEST VALUE= "YSTOP
  980 INPUT"LEGEND ",LY$
  990 DX=(XSTOP-XSTRT)/N%:DY=(YSTOP-YSTRT)/M%
 1000 IF DX<=0 OR DY<=0 PRINT"NONSENSICAL VALUES
"'" PRESS SPACE TO CONTINUE":ANS$=GET$:CLS:GOTO9
00
 1010 PROCFUNC
 1020 PRINT TAB(10,18)A$'TAB(8)"TAKES VALUES FRO
M"
 1030 PRINT TAB(10);MIN" TO "MAX
 1040 INPUT TAB(0,21)"AUTOMATIC CONTOUR SELECTIO
N(Y/N)?"ANS$
 1050 IF ANS$="N" NC%=-1:ENDPROC
 1060 INPUT"HOW MANY CONTOURS ? "NC%
 1070 ENDPROC
 1080 DEF PROCAUTO
 1090 C=C+DC:IF C>MAX THEN PROCMORE ELSE PRINT"C
=";C
 1100 ENDPROC
 1110 DEFPROCMORE
 1120 INPUT"EXTRA SPECIFIC CONTOURS?(Y/N)"ANS$
 1130 IF ANS$="Y" NC%=-1:PRINT"MAKE C OUT OF   RA
NGE TO STOP"
 1140 ENDPROC
 1150 DEFPROCFUNC
 1160 X=XSTRT:Y=YSTRT:MAX=EVAL(A$)
 1170 MIN=MAX:Y=YSTRT
 1180 FOR J%=0 TO M%
 1190 X=XSTRT
 1200 FOR I%=0 TO N%
 1210 F=EVAL(A$):F(I%,J%)=F
 1220 IF F>MAX MAX=F
 1230 IF F<MIN MIN=F
 1240 X=X+DX
 1250 NEXT
 1260 Y=Y+DY
 1270 NEXT
 1280 ENDPROC
 1290 DEFPROCDIVIDE(IX%,IY%,LX,LY,F0,F1,F2,F3)
 1300 LOCAL G1,G3,G4,G5,G7,LX1,LY1
 1310 G1=(F1+F0)/2:G3=(F0+F3)/2:G5=(F1+F2)/2:G7=
(F2+F3)/2:G4=(G3+G5)/2
 1320  LX1=LX/2:LY1=LY/2:IX%=IX%*2:IY%=IY%*2:B%=
B%+1
 1330 PROCSOU(C,IX%,IY%,F0,G1,G4,G3,LX1,LY1)
 1340 PROCSOU(C,IX%+1,IY%,G1,F1,G5,G4,LX1,LY1)
 1350 PROCSOU(C,IX%+1,IY%+1,G4,G5,F2,G7,LX1,LY1)
 1360 PROCSOU(C,IX%,IY%+1,G3,G4,G7,F3,LX1,LY1)
 1370 ENDPROC
```

BEEB TALKS TO BEEB

Joe Telford expands on his idea of inter-micro communication, and presents an interactive Battleship game for two micros

THIS month, prompted by a sackful of mail, we take another look at Beebtalk. No, not another review of Kenneth Kendall (have you entered the flourishing 'make Ken say rude words' contest?) but a further look at communication between two BBC micros. As an introduction, 'The 50p network' on page 53 of the June edition makes useful reading.

Figure 1 reproduces the connecting lead between two BBC micros, which covers the hardware side of allowing them to talk. Normally this lead is only a couple of metres long, and can be made from ribbon cable, though for longer distances (10 to 20 metres), a good quality shielded cable is useful.

In my quest to simplify communications, I have found two inbuilt commands in BBC Basic: one designed for transmission, and the other for receiving through the RS423 port. Both are easily available, but need further commands to support them.

The easiest method of transmitting information is to use the RS432 as a printer port. This handles all the status and control lines associated with the port. Transmission can be set up with just a few lines of program, or of direct commands:

```
*FX5,2
*FX7,8
*FX8,8
```

Once CTRL-B is pressed, or VDU2 typed, information input at the keyboard, or destined for the screen is sent through the RS423 port as if to a printer. For example, transmitting a message through the RS423 port may take the following form:

```
VDU2:P."WHERE'S MY LUNCH?":VDU3
```

If connected to a printer, this would simply be printed out, but if connected to another BBC micro in 'receive mode', it could be acted upon instantly. (Some hopes! Ed.)

Although text can be transmitted cleanly by this method, and Basic programs can be transmitted using the technique shown in June's *Acorn User*, we may wish to transmit bytes of information, for example a section of memory, which may contain weird and wonderful control codes. This is best done byte-by-byte, prefixing each one for transmission by VDU1, so it is not shown on-screen. Program 1 shows a possible solution to memory transfer. Lines 20,30 and 40 set up the RS423 port, while the loop from 90 to 110 sends each piece of data to the receiving BBC micro. Unfortunately, two major problems bar smooth running. The first is down to me, because if I cannot see data being transmitted, I tend to regard the whole thing as 'Deus ex machina' and shout 'fraud!' This problem is, however, simply remedied by adding an extension to line 100. Normally line 100 could read:

```
VDU1,?I%
```

but so the data set up for transfer can be seen, we de-select the printer port, print the contents of I% ORed with 32 to remove nasty control codes, then reselect the printer port, hence the

```
VDU1,?I%,3,?I% OR 32,2
```

The other problem affecting automatic transmission of memory is passing information relating to the start point in memory of the code, and its length (or end point).

At first I felt this was quite a problem, hence the coding of lines 130 to 160, which converted any hex string into a four-digit

```
   10 REM TRANSMIT MEMORY
   15 *FX5,2
   20 *FX7,8
   30 *FX8,8
   40 INPUT"START   "S$:S=EVAL(S$)
   50 INPUT"LENGTH "L$:L=EVAL(L$)
   60 PRINT "Transmitting:"
   70 VDU2:PRINT FNhex(S)+FNhex(L)
   90 FORI%=S TO S+L
  100 VDU1,?I%,3,?I% OR 32,2
  110 NEXT
  120 VDU3:PRINT "DONE":END
 1000 DEFFNhex(X):LOCALI%,R$
 1010 R$="":FOR I%= 1 TO 4
 1020 R$=MID$("0123456789ABCDEF",X MOD 1
6 +1,1)+R$:X=X DIV 16
 1030 NEXT:=R$
```

Program 1. Memory transmission

```
>

   10 *KEY0 *FX5,2|M*FX7,8|M*FX8,8|MCLS:
IN."START   "S$:IN."LENGTH "L$:P."TX"':VD
U2:PRINT S$+L$:FORI%=VAL(S$) TO VAL(S$)+
VAL(L$):VDU1,?I%,3,?I% OR 32,2:NEXT:VDU3
:PRINT "DONE"|M
```

Program 2. Tx by function key

```
>

   10 REM RECEIVE MEMORY
   20 *FX15,0
   30 *FX7,8
   40 *FX8,8
   50 *FX2,1
   60 S=EVAL("&"+GET$+GET$+GET$+GET$)
   70 L=EVAL("&"+GET$+GET$+GET$+GET$)
   80 CR=GET
   90 PRINT ~S,~L
  100 FORI%=S TO S+L
  110 ?I%=GET
  120 VDU?I% OR32
  130 NEXT
  140 PRINT "DONE":*FX2,0
```

Program 3. Memory reception routine

```
  10 *KEY1 *FX7,8|M*FX8,8|M*FX2,1|MCLS:
S%=EVAL("&"+GET$+GET$+GET$+GET$):L%=EVAL
("&"+GET$+GET$+GET$+GET$):C%=GET:P.~S%,~
L%:FORI%=S% TO S%+L%:?I%=GET:VDU?I% OR 3
2:NEXT:P."DONE":*FX2,0|M
```

Program 4. Memory Rx by function key

```
>
  10 *KEY0 *FX5,2|M*FX7,8|M*FX8,8|MCLS:
IN."START  "S%:IN."LENGTH "L%:P."TX"':VD
U2:P.S%:P.L%:FORI%=S% TO S%+L%:VDU1,?I%,
3,?I% OR 32,2:NEXT:VDU3:P."DONE"|M
```

Program 5. Final Tx routine

```
>
  10 *KEY1 *FX7,8|M*FX8,8|M*FX2,1|MCLS:
INPUTS%:INPUTL%:P.~S%,~L%:FORI%=S% TO S%
+L%:?I%=GET:VDU?I% OR 32:NEXT:P."DONE":*
FX2,0|M
```

Program 6. Final Rx routine

```
>
  10 *KEY0 *FX5,2|M*FX7,8|M*FX8,8|MCLS:
IN."START  "S%:IN."LENGTH "L%:IN."RELOCA
TE AT "R%:P."TX"':VDU2:P.R%:P.L%:FORI%=S
% TO S%+L%:VDU1,?I%,3,?I% OR 32,2:NEXT:V
DU3:P."DONE"|M
```

Program 7. Relocating Tx routine

```
>
   10 REM DATA TRANSMISSION
   20 *FX5,2
   30 *FX8,8
   40 *FX7,8
   50 top%=1440
   60 DIMtemp%(top%)
   70 TIME=0
   80 temp%(0)=ADVAL1 DIV 16
   90 FOR I%= 1 TO 1440
  100 t=TIME+3000:REPEAT UNTILTIME>t
  110 temp%(I%)=ADVAL1 DIV 16
  120 NEXTI%
  130 PRINT"Press SPACE to continue"
  140 *FX21,0
  150 REPEAT UNTIL GET=32
```

Program 8. Data logging

hex string including leading zeros. Up to this point I was convinced all reception would need to be done one byte at a time and four-byte hex strings are easily converted to numbers. For the benefit of those who always type in four-digit hex strings, the whole program was reduced to a function key format, so memory could be transmitted simply by pressing a key, and typing the start and length parameters, as shown in program 2.

Now for the other end. Receiving information along the RS423 lines is simple, in principle. The micro must be set up to receive only from the RS423 port, at the baud rate which matches transmissions from the other micro. This is done by either direct commands or during a program:

*FX15,0
*FX8,8
*FX7,8
*FX2,1

The *FX15,0 clears all buffers, but as we don't want to clear a buffer of vital information, always run the receive section before transmitting. Users who are less heavy-handed than I, might find more finesse with *FX21,1 (to clear the RS423 input buffer) or *FX21,2 (which clears the RS423 output buffer). The *FX2,1 turns over all input to the micro to the RS423 input lines. No keys (other than escape and break) have any effect, so at the end of the receiving section, the micro must be given a *FX2,0 command from either the sending machine, or the last part of its reception program. Such a program for memory reception from another machine might be expected to have four parts, as in figure 2.

Program 3 could be used with programs 1 or 2 to receive blocks of memory contents from another micro. Lines 60 and 70 set the start and length of the code, and the transferred block is 'picked up' and dumped in memory by lines 100 to 130. My personal need to see the data is covered by line 120, which again removes control codes by ORing with 32. Notice too, the important line 140, which returns control to the receiving (Rx) micro keyboard.

To make this routine more compact, I rewrote it for a function key (program 4). Remember the 256 character limitation of function keys, and clear them before using this definition (*FX18 does that!). It is as well to clear buffers before invoking f1 because including a buffer clear command in the definition could erase the definition before acting upon it.

When I ran programs 1 and 3 linked on separate machines originally, I found an extra byte appeared in the transfer. To remove it, I added the CR=GET of line 80

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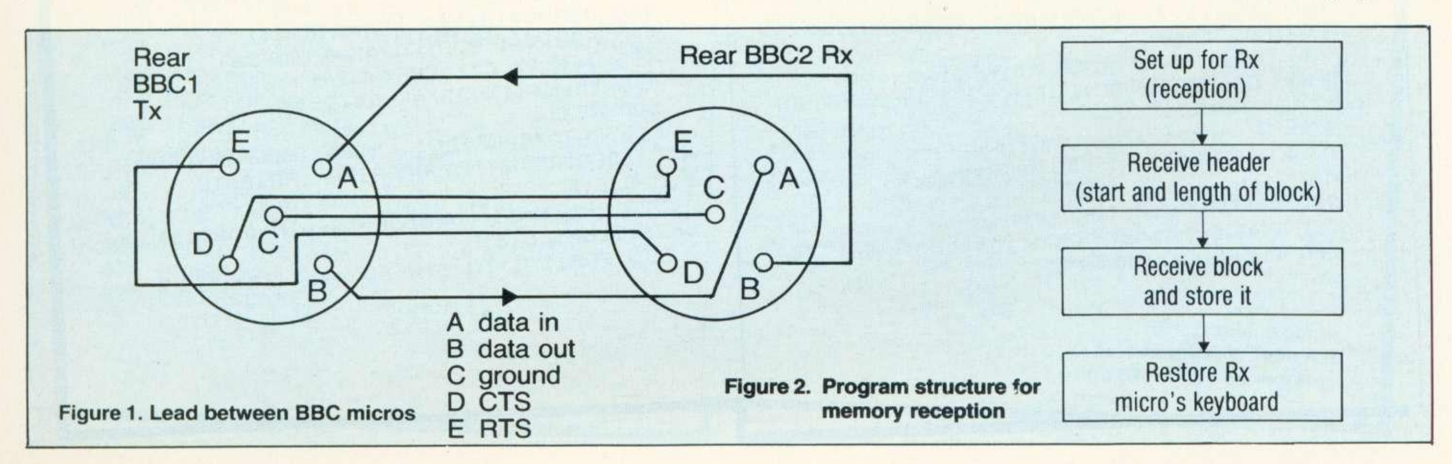


Figure 1. Lead between BBC micros

Figure 2. Program structure for memory reception



BATTL

RTX can be fun

Readers who have used the terminal software from June have commented that communication is addictive, and with this in mind I thought we might explore the idea as a game. As is inevitable with experimental approaches to computing, it is the old chestnuts which are implemented first, and the obvious application to rejuvenate is to apply RS423 to the 'battleships and cruisers' concept in a game called BBC Battle.

Rules and object of the game

The same program is loaded on each of two model B BBC micros, which are connected via the RS423 ports (figure 1). On start-up each micro displays a map of your own fleet, showing six each of carriers, battleships, cruisers, destroyers, submarines and frigates, on an 8×26 yellow grid. The craft are denoted by their initial letters and are listed at the right of the display. Below in red is a blank map which shows the information you have about the opposing player's ships, and to the right of the red map is a list of ships operating on the opposing team.

As soon as you are asked for a target coordinate, this can be entered in number, letter order. Pressing return dispatches the missile and you can then send another. If you wish to alter the target coordinates before firing, simply press the delete key and retype.

Reports from the front begin to fill in the red map to show your progress, either with the initial letter of the ship which you have destroyed, or with an explosion symbol when you hit water, or with nothing at all if your missile was destroyed in flight. The aim of the game then, is to completely destroy the opponent's fleet. Obviously, as you are doing this, he is trying to destroy your fleet, and his attempts are indicated on your yellow map. Because of the real-time aspect of the program, there is no need to take turns. Although your computer works for you, keyboard action must be

```
   10 REM BBC BATTLESHIPS
   20 REM FOR 2 BBC MICROS
   30 REM JOE TELFORD 1983
   40
   50 ON ERROR GOTO1040
   60 MODE1:PROCsetup
   70 PROCupdatescreen
   80 REPEAT
   90 COLOUR3:PRINTTAB(0,25);"AIM AT (<n
um><alpha>)......>              ":REPEAT:COLO
UR3:PRINTTAB(28,25);
  100 AA$=INKEY$(0):IFAA$="" PROCthem
  110 UNTILAA$>"0" AND AA$<"9" :PRINTAA$
;
  120 REPEAT:COLOUR3:PRINTTAB(30,25);
  130 B$=INKEY$(0):IFB$="" PROCthem
  140 UNTILB$=CHR$(127) OR (B$>="A" AND
B$<="Z")
  150 IF B$=CHR$(127) THEN90 ELSEPRINT;B
$
  160 REPEAT C=GET:UNTIL C=13 OR C=127:I
F C=127 THEN UNTIL FALSE
  170 FOR X= 1 TO 255 STEP 5:SOUND&11,-1
5,X,2:NEXT
  180 VDU2,1,77,1,ASC(AA$),1,ASC(B$),3
  190 PROCthem
  200 UNTILustot<1 OR themtot<1
  210  COLOUR3:PRINTTAB(0,23)"MESSAGE FR
OM THE FRONT........"
  220 IF ustot=themtot PROCdraw
  230 IF ustot<1 PROCthemwin ELSE PROCus
win
  240 DEFPROCupdatescreen
  250 PROCprintus:PROCprintthem:ENDPROC
  260 DEFPROCthemwin
```

```
  270 PRINTTAB(0,25);"AS WE HAVE NO SHIP
S LEFT WE SURRENDER!"
  280 END
  290 DEFPROCuswin
  300 PRINTTAB(0,25);"WE HAVE SUNK ALL E
NEMY SHIPS:              "
  310 PRINTTAB(0,27);"THEY SURRENDER!"
  320 END
  330 DEFPROCdraw
  340 PRINTTAB(0,25)"BOTH SIDES SUFFER T
OTAL LOSS OF ALL"
  350 PRINTTAB(0,27)"SHIPS....HOW ABOUT
A TRUCE?"
  360 END
  370 DEFPROCsetup
  380 *FX15,0
  390 @%=3
  400 *FX5,2
  410 *FX8,8
  420 *FX7,8
  430  VDU23,224,255,129,129,129,129,129
,129,255
  440 VDU23,225,8,42,172,157,94,60,189,2
55
  450 X$=CHR$225
  460 DIMus$(8,26),them$(8,26)
  470 FORI%=1 TO8:FORJ%=1 TO 26
  480 us$(I%,J%)=CHR$(224)
  490 them$(I%,J%)=CHR$(224)
  500 NEXT,
  510 DATA"CARRIER    ",BATTLESHIP,CRUISE
R    ,DESTROYER ,SUBMARINE ,FRIGATE    ,A,
B,C,D,E,F
  520 ustot=36:themtot=36:DIMname$(6),us
no(6),themno(6)
  530 FORI%=1 TO 6:READname$(I%):NEXT
```

ESHIP



fast and furious because, as in real life, the enemy will not wait for you.

THE main procedures of *BBC Battle* are:

PROCsetup;
PROCupdatescreen;
PROCthem; PROCsortout;
PROCprintus;
PROCprintthem;
PROCupus:
PROCupthem.

PROCsetup reserves space for the battle maps, and creates the players' fleet layouts. It also sets up the RS423 port, fleet information and the two user-defined characters used in the program.

PROCupdatescreen simply calls PROCprintus and PROCprintthem. PROCthem checks for output at the RS423 port and invokes appropriate action.

PROCsortout routes the action depending on what is received—to update our info, update the opponent's info or clear the buffer if garbage is detected (equivalent to destroying missiles in flight).

PROCprintus prints our battle map and fleet info, while PROCprintthem prints the opponent's map as far as it is known, and the enemy fleet's status.

PROCupus checks our battle map at the opponent's missile coordinates, and returns to the opponent what he has hit, then updates our map and fleet info. PROCupthem updates the red map as a result of information returned from the opposing micro.

The main body of the program is from 80 to 200 and it is concerned with checking for info from the RS423 port (by calls to PROCthem) and handling the build-up of missile coordinates from the keyboard. This part loops until one or both fleets are destroyed, and then prints a suitable ending comment.

One last point, if you have RTX problems, try reducing the baud rate on both micros, but beware, there is no software fix for an RS423 cable incorrectly made up. One final point: I'd like to thank Chris Pearson from Norton for the use of his micro during program testing sessions. ●

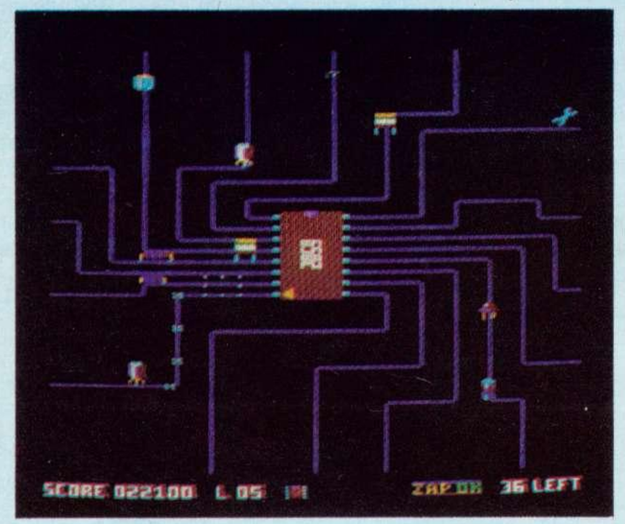
```
  540 FORI%=1 TO 6:usno(I%)=6:themno(I%)
=6
  550 NEXT:dummy=RND(-TIME)
  560 FOR P= 1 TO 6:FOR Q=1 TO6
  570 L=RND(8):M=RND(26):IF us$(L,M)<>CH
R$(224) THEN 570
  580 us$(L,M)=MID$("ABCDSF",P,1)
  590 NEXT,
  600 ENDPROC
  610  DEFPROCprintus
  620 VDU30:PRINT'':COLOUR3:PRINT" ABCDE
FGHIJKLMNOPQRSTUVWXYZ        *US*"
  630 FORI%=1 TO8:
  640 COLOUR3:PRINT;I%;:COLOUR2
  650 FORJ%=1 TO26
  660 PRINTus$(I%,J%);:NEXT:PRINT:NEXT
  670 FORJ%=1TO6:PRINTTAB(28,J%+4)name$(
J%)" ";usno(J%):NEXT
  680 ENDPROC
  690 DEFPROCprintthem
  700 PRINTTAB(0,13);:COLOUR3:PRINT" ABC
DEFGHIJKLMNOPQRSTUVWXYZ       *THEM*"
  710 FORI%=1 TO8
  720 COLOUR3:PRINT;I%;:COLOUR1
  730 FORJ%=1 TO26
  740 PRINTthem$(I%,J%);:NEXT:PRINT:NEXT
  750 FORJ%=1TO6:PRINTTAB(28,J%+14)name$
(J%)" ";themno(J%):NEXT
  760 ENDPROC
  770 DEFPROCupthem
  780 them$(ASC(XL$)-48,ASC(YL$)-64)=T$:
IFP<7 themtot=themtot-1:themno(P)=themno
(P)-1
  790 IF P>0 AND P<7 THEN SOUND1,-15,(P-
1)*50,4
  800 PROCprintthem
  810 ENDPROC
  820 DEFPROCupus:LOCALushit$
  830 ushit$=us$(ASC(XL$)-48,ASC(YL$)-64
):us$(ASC(XL$)-48,ASC(YL$)-64)=CHR$(225)
  840 IFushit$=CHR$(224) ushit$=CHR$(225
)
  850 Q=INSTR("ABCDSF",ushit$):IF Q>0 TH
EN usno(Q)=usno(Q)-1:ustot=ustot-1
  860 VDU2,1,ASC(ushit$),1,ASC(XL$),1,AS
C(YL$),3
  870 PROCprintus
  880 ENDPROC
  890 DEFPROCthem
  900 *FX2,1
  910 T$=INKEY$(25):IF T$=""THEN930
  920 IFINSTR("ABCDSFM"+X$,T$) PROCsorto
ut
  930 *FX2,0
  940 ENDPROC
  950 DEFPROCsortout
  960 XL$=GET$:YL$=GET$
  970  IFXL$<"9" AND XL$>"0" GOTO1000
  980 *FX15,0
  990  ENDPROC
 1000 P=INSTR("ABCDSF"+X$,T$):IFP>0 PROC
upthem:ENDPROC
 1010 FOR X=255 TO 1 STEP -5:SOUND&11,-1
5,X,2:NEXT:SOUND0,-15,100,10
 1020 PROCupus
 1030 ENDPROC
 1040 *FX2,0
 1050 MODE7:REPORT:PRINT" AT ";ERL
```

BBC Battle, a game for two micros. Take out line 50 for any debugging.

TWO EXCITING NEW 100% MACHINE CODE GAMES FROM

SoftSpot

FOR BBC MODEL B (OR MODEL A + 32K + 6522 VIA)





TRANSISTORS REVENGE by Chris Butler
Your BBC Micro is under attack! The components on the circuit board are attacking the CPU. Can you stave off the many marauders by firing pulses of electricity along the data lines of the 6502. Beware of the deadly mains spikes zipping along the tracks and hit the tools on the edge of the circuit for bonus points. For emergencies only the ZAP button will destroy everything with an explosion of debris.

Features include fast smooth multicoloured characters, 8 types of component, 4 types of tools, increasingly difficult track patterns, multiple firing, interrupt driven graphics, sound effects, high scores, bonus etc.

HEIST by Marcus Altman
"Look out investors your local bank is being robbed!" Manoeuvre the bank manager around the building, collecting money bags and returning them to the vault — Dodge the ever chasing robbers or bop them on the head with a hammer. Beware of the time bomb which you must defuse or you will sprout wings and fly to heaven.

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▶ *page 35*

in program 3. Indeed, examining the contents of CR showed the &0D character, a carriage return. The default value of *FX6 being *FX6,10 had prevented an additional character &0A (linefeed) from also being transmitted. This means any PRINTed numbers and strings are transmitted byte-by-byte followed by a carriage return, so when the Rx micro is listening to the RS423 port, PRINTed characters enter the port in much the same way as characters are normally typed at the keyboard. This means we can short-circuit the way we transmit headers, by sending them as variables. Programs 5 and 6 are the final concise routines in function keys for transmitting the contents of memory between BBC micros.

The benefit of these short routines is that we can use single-character integer variables. This means we can copy almost any part of memory from one machine to another. Because these programs only use memory allocated to screen, keyboard buffer, integer-variable storage and RS423 buffers, large chunks of coding can be copied across in the area between PAGE and HIMEM. You may encounter the odd problem in transferring memory below PAGE (say from location 0 to 256) or from the workspace of a machine with Watford's DOS to one with Acorn's DFS. Normally there should be no need to transplant vital areas of one micro's workspace to another, as rejection often sets in.

Final instructions for transfer are:

- LOAD both routines, one on each machine, preferably as function keys stored temporarily in line 10 as shown in programs 4 and 5. Run these one-line programs to place them into the keys f1 and f0, and then NEW the one-liner you have just run, as it is no longer needed.
- Produce, on the Tx micro, the section of code you wish to copy.
- Clear buffers on both micros.
- Press f1 on the Rx micro.
- Press f0 on the Tx micro.
- Type the start address then the length on the TX micro.
- Memory contents will then be copied across.

In answer to the question 'How do I load a Basic program into both micros when only one is connected to a disc drive? I suggest reading page 53 of the June issue.

One useful possibility is to copy from location A on the Tx machine, to location B on the Rx micro, and a simple alteration to the Tx routine is all that is needed. We must enter the start and length as before, but now we must also enter the relocation address, which will be regarded as the start on the Rx machine. No alterations are needed to the Rx routine, and the relocating Tx routine is program 7.

The logical follow-on from transferring the contents of memory locations between machines is to transfer data files. I found that my requirements were to take a list or array of data from a cassette-based micro and send it via an upgraded machine to disc. A particular problem I had was in measuring the temperature variation in a room over 12 hours, taking readings every 30 seconds. As I could borrow a standard model B, this meant it could do the drudgery of measuring and recording, while I could continue other work on my own disc micro. The only problem would be saving data. As I had little desire to return to using the cassette filing system, the logical solution was to transfer data. Program 8 shows the basic data gathering program. I have left the ADVAL channel unscaled, because this depends on the calibration of whatever temperature-sensing device is used.

As I wanted 12 hours of recordings, each 30 seconds apart, I needed 12*2*60, or 1440 data items, plus the start item at time 0. Line 60 creates the list space, line 80 takes care of the 0th item and the loop from 90 to 120 takes 1440 regular readings at 30 second intervals. Lines 130 to 150 provide a definite point where the user can resume control of the program ready for transfer.

Considering data transfer of a list to disc, the only items we need to transmit as a header are the file name, and the number of the item at the top of the list. A two-dimensional array would need both these items plus the number of zones across the array. A third array would need the second header, plus the depth of the array, and so on.

For our purposes, program 9, which is used with program 8, shows a technique for transmitting lists to disc. Line 170 asks for the filename, and lines 180 and 190 inform us what is happening. Then at line 200 we transmit the header, ie, file name and the number of the top of the list. The loop from 210 to 230 sends each piece of data.

Rather than worry about re-creating the array or list in the Rx micro, I decided to push it straight to disc. Then, when time allowed, I could work on it without the transfer programs and wires around me. This also meant I could develop a general-purpose list saving routine which would work whatever was sent to it. Program 10 shows the result.

The program up to line 50 sets up the Rx micro to listen to the RS423 port, while lines 60 and 70 get the header. Lines 80 and 90 open the data file on disc, and PRINT# the list length (N$) as the first item on file. Hence, on future accesses to the file we can read its length immediately. Lines 100 to 120 take each item sent from the Tx micro and PRINT# them to the file. Notice that all variables are converted to strings on INPUT. This is so the general-purpose Rx routine will handle string and numeric lists, or combinations. The last line, 130, returns control of the Rx micro to its keyboard. Program 11 gives this Rx routine as a function key, although buffer clearing is left to be used as a direct command before pressing f1. Remember—as with memory transfer, set up the Rx side before transmitting. ●

```
170 INPUT'"Filename "F$
180 PRINT'"top of list is item ";top%
190 PRINT"Transmitting ";
200 VDU2:PRINTF$:PRINTtop%
210 FOR I%=0 TO top%
220 PRINTtemp%(I%)
230 NEXT
240 VDU3
250 PRINT"DONE":END
```

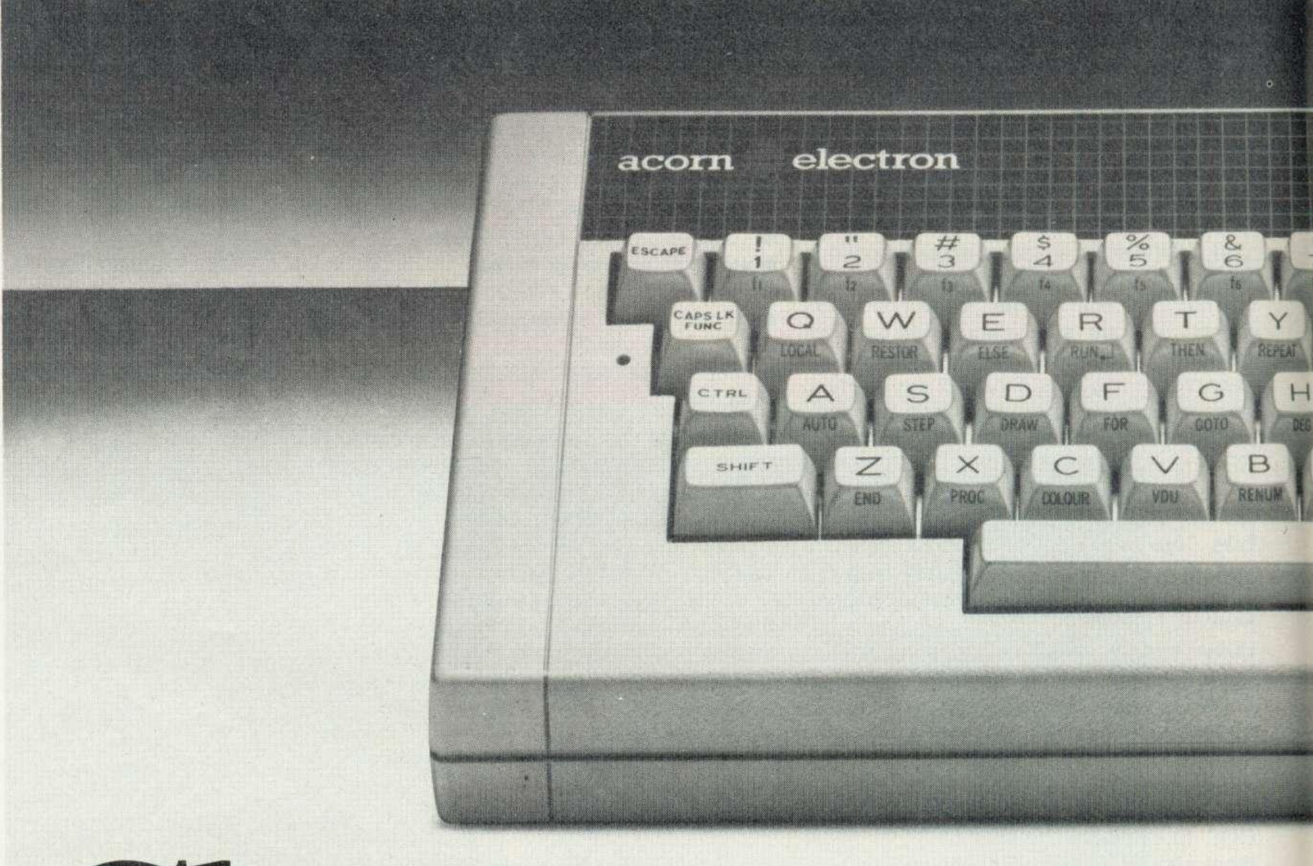
Program 9. Data Tx

```
>
 10 REM DATA RECEPTION
 20 *FX15,0
 30 *FX8,8
 40 *FX7,8
 50 *FX2,1
 60 INPUTF$
 70 INPUTN$
 80 ch%=OPENOUTF$
 90 PRINT#ch%,N$
100 FOR I%= 0 TO VALN$
110 INPUT Rx$:PRINT#ch%,Rx$
120 NEXT:CLOSE#ch%:PRINT"DONE"
130 *FX2,0
140 END
```

Program 10. Data Rx

```
>
   10 *KEY1 *FX8,8|M*FX7,8|M*FX2,1|MCLS:
IN.F$:IN.N$:ch%=OPENOUTF$:P.#ch%,N$:FOR
I%= 0 TO VALN$:IN.Rx$:PRINT#ch%,Rx$:NEXT
:CLOSE#ch%:P."DONE":*FX2,0|M
```

Program 11. Function key Rx



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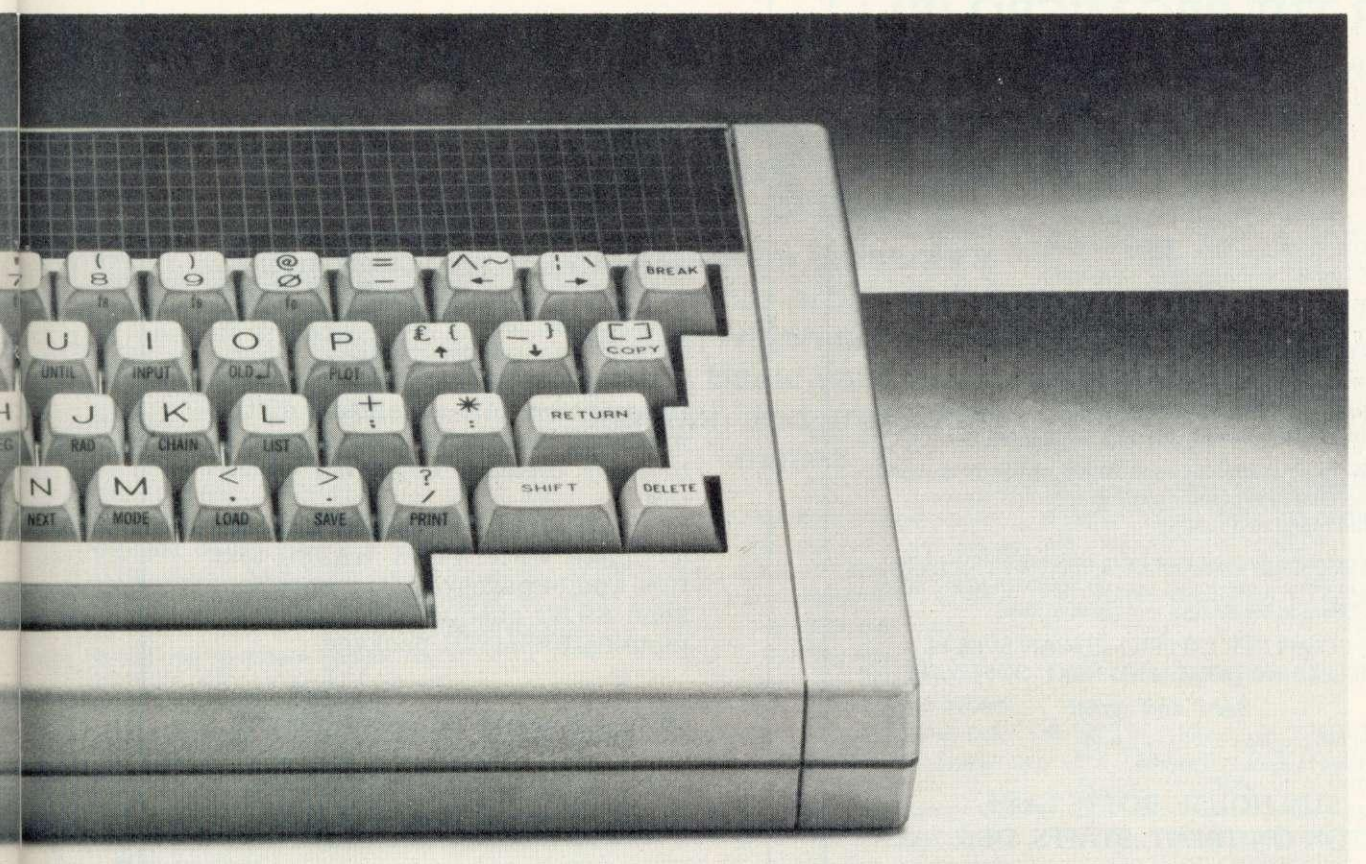
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FIND NAMES WITH XREF

Ian Graham presents a BBC micro program (16 or 32k) which sorts and lists Basic variable, function and procedure names

XREF is designed to produce a cross-reference listing of variable, function and procedure names in a Basic program. It is very useful as a debugging aid and produces documentation to keep with listings.

The program will run on either a 16 or 32k BBC micro. It reads the program to be analysed as a data file, which is produced by the standard SAVE command for a Basic program. XREF has been written to use cassette files, although it should also work with discs.

The output from XREF shows for each variable, function or procedure name, all the line numbers in the program which contain a reference to that name. XREF splits the names into eight classes:

- integers
- reals
- strings
- integer arrays
- real arrays
- string arrays
- functions
- procedures.

The names within each class are sorted into alphabetic order, and the line numbers listed against each name appear in numeric order. Where a name is referenced several times in a particular line, the line number is shown only once.

To use XREF, load and run it. On a 32k machine, you will be asked whether you want the results displayed as 40 or 80 character lines. Then enter the name of the program to be analysed. Put the tape containing this program into your recorder and run it on to just before the required program (it does not really matter if you read through other programs first, all that happens is the screen scrolls while listing the earlier programs). The program is then analysed by XREF. This takes a little time, for example XREF takes three minutes to analyse itself. The names are then sorted. Finally, you are asked to select one of three options: Display on the screen; Print the results or End the process. These options are repeated until you select End. The print option will produce an 80 character per line listing irrespective of the display width selected earlier. To XREF another program just run it again.

XREF stores the results using four arrays. The names are held by the string array var$. Line numbers are stored in the area of RAM reserved by the DIM statement of line 80 and referenced by the variable 'lines'.This area consists of a number of entries each of four bytes. The first two bytes of each entry is the line number, the second two bytes is a pointer to the next extry in the area for the same name.

Names and line numbers are linked together using a two-column table in the array ptr%. The first column links together all the names in a particular class, the second points to the first line number for the name in the lines array. The nth entry in ptr% corresponds to the nth name in var$. The eight elements of the root% array point to the first entry in ptr% for each class of name. Hence the data is stored as lists of objects in these arrays. The names are sorted by moving the list pointers around in ptr% instead of moving the actual data. The sorting algorithm is a simple bubble sort.

Line 50 selects the size of arrays depending on the amount of RAM available and the screen mode required. Up to 100 names and 700 line numbers are allowed on a 16k machine, or a 32k machine with an 80-character screen (mode 3). However, 400 names and 3000 line numbers are allowed on a 32k machine with a 40 character screen (mode 7). The approximate ratio of seven line numbers to each name was chosen because it happens to be the ratio occurring in most of my programs. The ratio can be altered in line 50 by changing the v_lim% and n_lim% values—allow 10 bytes per name and keep the total of 10 * v_lim% + 4 * n_lim% about the same. To provide a reasonable number of names and lines on a 16k machine, REM statements have been reduced to a minimum. No attempt has been made to process variable names which appear in assembler statements.

Lines 70-90 dimension the arrays, reserve space for line numbers and initialise the locations where required. Lines 150-380 process each Basic line. Lines 230-370 process each Basic statement in a line. Lines 270-350 process the 'elements' in each statement. Lines 440-510 repeatedly display or print the results until the End function is selected.

Line 470 switches the printer on, switches the screen off, prints the results, switches the screen on and switches the printer off. The parameter passed to PROCresults determines the length of the print lines—if you want a different line length, set this to two less than the maximum line length your printer uses. For example, to get a 132 character line change 78 to 130.

When XREF is run, an error report may be produced in the format:

'Error message' at line n
x variables, y lines
Do you want partial result? (Y/N)

The 'line n' refers to the line number in the program being read, the numbers x and y are the number of variable names and line numbers stored so far. If you answer 'Y' to the prompt, the results so far will be sorted and displayed; any other reply ends the program.

Error messages may be:

- Format error—This means the format of the input line does not match the expected structure of a Basic program, possible causes are: a bug in XREF; input program not Basic in SAVE format; invalid Basic program being read.
- Too many variable names.
- Too many line numbers.
  These last two messages mean the array limits have been exceeded. If you have 32k RAM with an 80 character screen selected, re-run XREF using a 40 character screen. If this still produces the error, or if you have 16k RAM, try 'tuning' XREF to the particular program – for example if the variable names run out of space, increase v_lim% and decrease n_lim% in line 50. Similarly if the lines run out of space, increase n_lim% and decrease v_lim% in line 50.
- Other errors, for example filing system errors, are reported in a similar manner, in this case 'line n' refers to the line in XREF. The line number in the program being read is also displayed.

To keep XREF to a manageable size, no attempt is made to do any syntactic or semantic analysis. This means variables in DATA statements are ignored. Second, string variables are ignored in MOS statements – no other variable types are allowed in these lines. Finally, since the variable TOP is only partially tokenised (TO+P) the statement FOR I=1TOP with no space between TO and P will cause XREF to ignore the P as a variable name.

XREF does allow for variable names starting with £ and _ (underline).

If you type in XREF, take great care entering lines 1080 onwards since any mistakes will be difficult to debug. Note also the use of the underline character in some of the names – this looks like a hyphen in mode 7, only a little longer. ●

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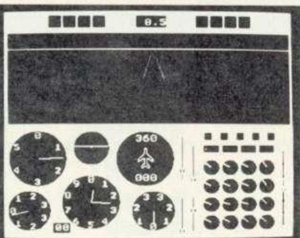
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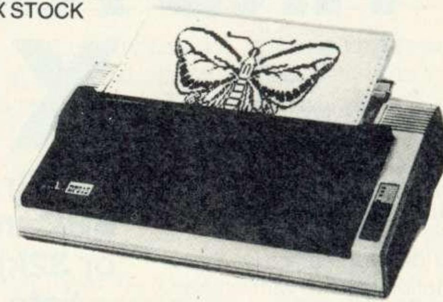
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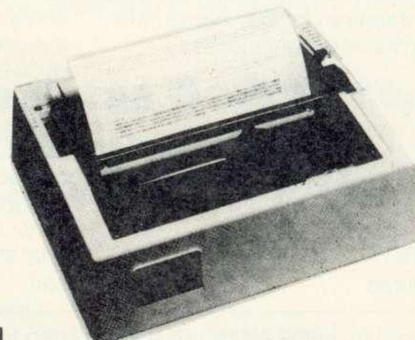
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XREF for 16k or 32k

```
   10REM XREF Mk2A Copyright (C) Ian Graham 1983
   20MODE7
   30box$=CHR$131+CHR$157+CHR$133
   40PROCintro
   50IF screen%=80 OR HIMEM<31700 THEN v_lim%=100:n_lim%=700 ELSE v_lim%=400:n_lim%=3000
   60v_free%=0:n_free%=0:ass%=FALSE
   70DIM root%(7):FOR I%=0TO7:root%(I%)=-1:NEXT:A$=STRING$(32," "):line%=0
   80DIM var$(v_lim%),ptr%(v_lim%,1),lines n_lim%*4-1
   90FOR I%=0 TO (n_lim%-1)*4 STEP 4:lines!I%=0:NEXT
  100*OPT 1,1
  110F%=OPENUP(P$)
  120ON ERROR GOTO 540
  130PRINTTAB(20,20)box$;"Analysing  ";CHR$156;
  140B%=BGET#(F%)
  150REPEAT
  160REM Line
  170IF B%<>&0D THEN PROCerror(1):GOTO380
  180B%=BGET#(F%)
  190IF B%=&FF THEN GOTO 380
  200line%=256*B%+BGET#(F%)
  210len%=BGET#(F%)-4
  220B%=BGET#(F%)
  230REPEAT
  240REM Statement
  250IF B%=32 THEN REPEAT:PROCread:UNTIL B%<>32:IF len%=0 THEN GOTO 370
  260IF B%=42 THEN PROCmos:GOTO 370
  270REPEAT
  280REM Element
  290IF B%=91 OR ass% THEN PROCassembler:GOTO 350
  300IF B%=34 THEN PROCstring:GOTO 350
  310IF B%=38 THEN PROChex:GOTO350
  320IF B%>&80 THEN PROCkeyword:GOTO 350
  330IF (B%>=64 AND B%<=90) OR (B%>=95 AND B%<=122) THEN PROCvariable(0):GOTO 350
  340PROCread
  350UNTIL B%=58 OR len%=0
  360IF B%=58 THEN PROCread
  370UNTIL len%=0
  380UNTIL B%=&FF
  390CLOSE# F%
  400ON ERROR OFF
  410PRINTTAB(23,20)"Sorting  "
  420PROCsort
  430PRINTTAB(23,20)"Finished "
  440REPEAT
  450INPUTTAB(0,23)"Select Display(D), Print(P) or End(E) "A$
  460A$=LEFT$(A$,1)
  470IF A$="P" THEN VDU2,21:PROCresults(78):VDU6,3
  480IF A$<>"D" THEN GOTO510
  490IF screen%=80 THEN MODE3:VDU19,0,4,0,0,0,19,1,3,0,0,0 ELSE CLS
  500VDU14:PROCresults(screen%-2):VDU15
  510UNTIL A$="E"
  520MODE7:*OPT
  530END
  540PROCerror(4):GOTO 390
  550DEFPROCread:len%=len%-1:B%=BGET#(F%):ENDPROC
  560DEFPROCintro
  570FOR I%=0TO1:PRINTTAB(10,I%)CHR$141;box$;"X R E F  ";CHR$156:NEXT
  580PRINT'"  This program will produce a cross"'"reference listing of the variables and"'"line numbers in a BASIC program. The"'"contents of REM, DATA and assembler"'"statements are ignored."
  590IF HIMEM>31700 THEN REPEAT:INPUTTAB(2,9)"40 or 80 character screen ",screen%:UNTIL screen%=40 OR screen%=80 ELSE screen%=40
  600INPUTTAB(2,11)"Enter the name of the program to be   analysed "P$
  610PRINT'"  Load tape containing ";P$'
  620ENDPROC
  630DEFPROCassembler
```

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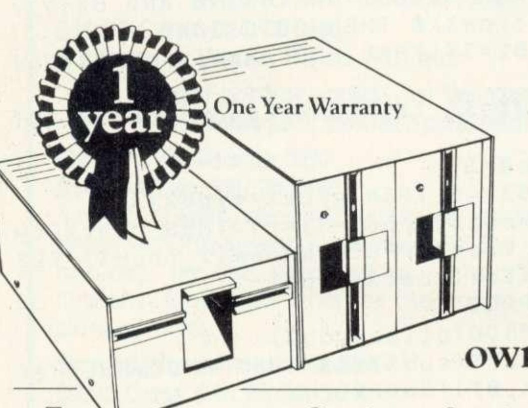
► page 47

```
  640ass%=TRUE
  650REPEAT:PROCread:UNTIL B%=93 OR len
%=0
  660IF B%=93 THEN PROCread
  670ENDPROC
  680DEFPROCstring
  690REPEAT:PROCread:UNTIL B%=34
  700PROCread
  710ENDPROC
  720DEFPROChex
  730REPEAT:PROCread:UNTIL B%<48 OR B%>
70 OR (B%>57 AND B%<65)
  740ENDPROC
  750DEFPROCkeyword
  760REM and DATA
  770IF B%=&DC OR B%=&F4 THEN REPEAT:PR
OCread:UNTIL len%=0:ENDPROC
  780REM FN
  790IF B%=&A4 THEN PROCread:PROCvariab
le(7):ENDPROC
  800REM PROC
  810IF B%=&F2 THEN PROCread:PROCvariab
le(8):ENDPROC
  820REM GOTO and GOSUB
  830IF B%=141 THEN PROCread:PROCread:P
ROCread:PROCread:ENDPROC
  840REM TOP
  850IF B%<>&B8 THEN GOTO 890
  860PROCread
  870IF B%=80 THEN PROCread:ENDPROC ELS
E ENDPROC
  880REM LISTO
  890IF B%<>&C9 THEN GOTO 920
  900PROCread
  910IF B%=79 THEN PROCread:ENDPROC ELS
E ENDPROC
  920PROCread
  930ENDPROC
  940DEFPROCmos:REPEAT:PROCread:UNTIL l
en%=0:ENDPROC
  950DEFPROCvariable(type%)
  960A$=""
  970REPEAT
  980A$=A$+CHR$(B%)
  990PROCread
 1000UNTIL len%=0 OR B%<48 OR B%>122 OR
(B%>57 AND B%<65) OR (B%>90 AND B%<95)
 1010IF type%>0 THEN GOTO 1060
 1020IF B%=37 THEN PROCread:type%=1:GOT
O 1050
 1030IF B%=36 THEN PROCread:type%=2:GOT
O 1050
 1040type%=3
 1050IF B%=40 THEN type%=type%+3
 1060IF root%(type%-1)=-1 THEN root%(ty
pe%-1)=v_free%:PROCnewname(v_free%) ELS
E PROCfollow(root%(type%-1))
 1070ENDPROC
 1080DEFPROCfollow(sub%)
 1090IF var$(sub%)=A$ THEN PROCaddline(
ptr%(sub%,0)):ENDPROC
 1100IF ptr%(sub%,1)=-1 THEN ptr%(sub%,
1)=v_free%:PROCnewname(v_free%):ENDPROC
 1110PROCfollow(ptr%(sub%,1))
 1120ENDPROC
 1130DEFPROCnewname(sub%)
 1140var$(sub%)=A$
 1150ptr%(sub%,0)=n_free%
 1160ptr%(sub%,1)=-1
 1170PROCnum(n_free%,line%)
 1180n_free%=n_free%+1
 1190IF n_free%>n_lim% THEN PROCerror(3
)
 1200v_free%=v_free%+1
 1210IF v_free%>v_lim% THEN PROCerror(2
)
 1220ENDPROC
 1230DEFPROCaddline(sub%)
 1240IF FNlptr(sub%)<>0 THEN PROCaddlin
e(FNlptr(sub%)):ENDPROC
 1250IF FNlnum(sub%)=line% THEN ENDPROC
 1260PROCptr(sub%,n_free%)
 1270PROCnum(n_free%,line%)
 1280n_free%=n_free%+1
 1290IF n_free%>n_lim% THEN PROCerror(3
)
 1300ENDPROC
 1310DEFPROCresults(width%)
 1320PRINT"XREF analysis of program ";P
$
```

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Microware presents the latest news on BBC.

N.B. 40/80 Format Switch – call for information



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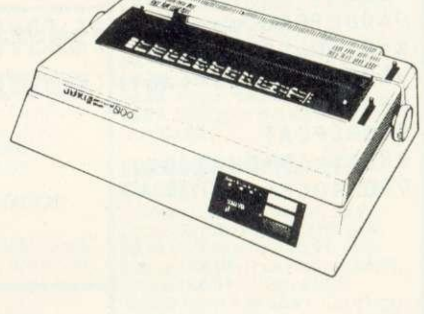
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ZL142	Single plus PSU	500K	200K	62	315.00	5
ZL241B	Single no PSU	500K	200K	62	220.00	10
ZL241	Single plus PSU	500K	200K	62	265.00	5
ZL242	Single plus PSU	1Mb	400K	124	415.00	5
ZL291B	Single no PSU	1Mb	400K	62	290.00	10
ZL291	Single plus PSU	1Mb	400K	62	355.00	5
ZL292	Single plus PSU	2Mb	800K	124	575.00	5

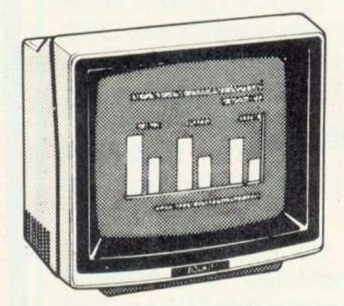
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▶ page 47

```
1330RESTORE
1340FOR type%=ØTO7
1350READ A$:I%=(width%-LEN(A$))DIV2:PRINT''STRING$(I%,"-")+" "+A$+" "+STRING$(I%,"-");
1360PROCprint(root%(type%),width%)
1370NEXT
1380PRINT''''
1390ENDPROC
1400 DATA INTEGERS,,%,STRINGS,,$,REALS,,,INTEGER ARRAYS,,%(),STRING ARRAYS,,$(),REAL ARRAYS,,(),FUNCTIONS,FN,,PROCEDURES,PROC,
1410DEFPROCprint(sub%,width%)
1420READ pre$,suf$
1430IF sub%=-1 THEN PRINT'"None.":ENDPROC
1440REPEAT
1450PRINT''pre$;var$(sub%);suf$'"";
1460I%=ptr%(sub%,Ø)
1470REPEAT
1480IF width%-COUNT<LEN(STR$(FNlnum(I%))) THEN PRINT'"      ";
1490PRINT;FNlnum(I%);
1500I%=FNlptr(I%)
1510IF I%>Ø PRINT;",";
1520UNTIL I%=Ø
1530sub%=ptr%(sub%,1)
1540UNTIL sub%=-1
1550ENDPROC
1560DEFPROCsort
1570FOR I%=ØTO7
1580IF root%(I%)=-1 THEN GOTO 1740
1590REPEAT
1600noswap%=TRUE
1610J%=root%(I%)
1620K%=ptr%(J%,1)
1630IF K%=-1 THEN GOTO 1730
1640IF var$(J%)>var$(K%) THEN noswap%=FALSE:root%(I%)=K%:ptr%(J%,1)=ptr%(K%,1):ptr%(K%,1)=J%
1650r%=root%(I%)
1660REPEAT
1670J%=ptr%(r%,1)
1680K%=ptr%(J%,1)
1690IF K%=-1 THEN GOTO 1720
1700IF var$(J%)>var$(K%) THEN noswap%=FALSE:ptr%(r%,1)=K%:ptr%(J%,1)=ptr%(K%,1):ptr%(K%,1)=J%
1710r%=ptr%(r%,1)
1720UNTIL K%=-1
1730UNTIL noswap%
1740NEXT
1750ENDPROC
1760DEFPROCerror(err%)
1770IF err%=1 THEN PRINT'"Format error";
1780IF err%=2 THEN PRINT'"Too many variable names";
1790IF err%=3 THEN PRINT'"Too many line numbers";
1800IF err%=4 THEN REPORT:PRINT;" at line ";ERL'"Input line is ";line%:GOTO 1830
1810 PRINT" at line ";line%'v_free%;" variables, ";n_free%;" lines."
1820len%=Ø:B%=&FF
1830INPUT"Do you want partial result ?(Y/N)"A$:IF A$<>"Y" THEN END
1840ENDPROC
1850DEFPROCnum(sub%,line%)
1860lines?(sub%*4)=line%DIV256
1870lines?(sub%*4+1)=line%MOD256
1880ENDPROC
1890DEFPROCptr(sub%,next%)
1900lines?(sub%*4+2)=next%DIV256
1910lines?(sub%*4+3)=next%MOD256
1920ENDPROC
1930DEFFNlnum(sub%):=lines?(sub%*4)*256+lines?(sub%*4+1)
1940DEFFNlptr(sub%):=lines?(sub%*4+2)*256+lines?(sub%*4+3)
```


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ASSEMBLER COMMANDS IN BASIC

Ian Birnbaum reveals the new commands in Basic II on the Beeb and Electron

READERS have asked me about the new assembler commands in Basic II (standard on the Electron) and to say something about *CODE and *LINE (available on MOS 1.0 onwards, again standard on the Electron). In this, the first of three articles, I will look at *CODE, *LINE and some simpler uses of the EQU family of commands. In the next article I will deal with the use of EQUS in macros and conditional assembly, and in the last with advanced uses of OPT and where to locate machine code.

These articles are intended for those reasonably well acquainted with assembler. If you are not yet one of these people, I suggest a look at a good book on assembly language for the BBC micro or Electron. (Modesty forbids me to name my recommendation: suffice it to say that a version of my BBC book for the Electron will be published in the New Year!)

Let's start with *CODE U,V. This command puts the value U into the X register, V into the Y register and 0 into the accumulator (of course only constants may be used with *CODE unless you use OSCLI to pass variables to the operating system). An indirect jump is then made to the contents of &200 and &201, referred to as the user vector, or USERV. Normally, the contents of these locations point to a routine which prints out the message 'Bad command'. However, by changing the contents to point to your own routine, you can pass to that routine the values U and V in the X and Y registers. This may not seem particularly useful, but its main purpose will become apparent when we look at the next command, *LINE.

The form of this command is *LINEs, where s denotes a string of characters which should *not* be enclosed in quotes unless you also want to pass these quotes to your routine. Again, a jump is made to the contents of USERV, but this time the contents of X and Y point to the starting address of the string (low byte in X, high byte in Y) and the accumulator contains 1. Thus, the accumulator can be used to decide whether the indirection has come from *CODE or *LINE.

The main purpose of *LINE is to enable a variety of new commands to be used in Basic programs. For example, *LINE GRAPH can be decoded accordingly and appropriate action taken. A disadvantage of this approach, though, is that no values can be passed to the subroutine GRAPH without some fairly complex coding. In such a case, CALL with parameters is the easier choice, though it does have disadvantages which we will mention in a moment.

However, to pass no more than two values, both within the range 0 to 255, you can use *CODE as well. So, for example, you might write:

```
*LINE GRAPH
*CODE 52,200
```

to pass 52 and 200 to the routine GRAPH. The advantage of this over CALL is that to write CALL GRAPH one would need to equate GRAPH to some specific location within a program, which makes it fiddly to use a library of extra commands. With *LINE one can just boot a disc say, which will load in the code for the extra commands and set up &200 and &201 accordingly. From then on, one can refer to the newly-defined commands simply using *LINE and *CODE. (It is worth adding that if you want to pass lots of parameters you *can* use X and Y to point to a parameter block as with OSWORD. However, this becomes so fiddly for the user that the advantage over CALL is lost, and so is not recommended.)

Let us look at a program which uses this idea. At the same time we can introduce EQU assembler commands. Program 1 shows how to use the idea outlined above to accommodate three new commands – GRAPH, GRID and STAR. The general approach is that *LINE goes to a routine which checks the string – it must be exactly correct or 'Bad command' will be printed. If the command is GRAPH, 1 is put in &70; if GRID, 2 is put in &70; if STAR, 3 is put in &70. (Thus the method will accommodate up to 256 commands.)

*CODE then transfers parameters in X and Y to the appropriate routine. In the listing, these routines just output the letter A, B or C and store X and Y, to test the method is working. Obviously in real applications these routines would do rather more!

Before I detail the routine, look at lines 690 to 790 where the new EQU commands are used. EQUB 100 allows us to put the single byte 100 into the next space pointed to by P%, without having to leave the assembler. It is therefore equivalent to ?P%=100, which we could only use outside the assembler. Similarly EQUW &10D puts two bytes into memory, and so is equivalent to EQUB 13: EQUB 1 (note that it is the *low* byte first). Again EQUD (which we have not used in this program) would put four bytes into memory (in the same way, EQUD assembles the bytes lowest first).

The final command is EQUS: this puts the ASCII values of a string into memory, again starting at the first free location pointed to by P%. It is therefore like $P% except no carriage return is included. To include one, use EQUB 13 (or as here EQUW &10D since we require 1 also, as we shall see).

Let us look in detail at the lines of the program.

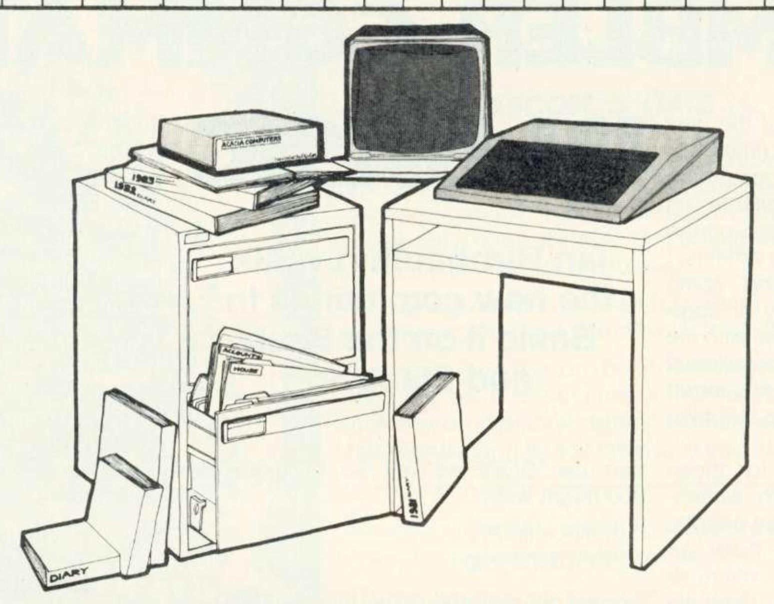
30	The contents of USERV originally point to 'Bad command', and this is &E310.
40	Put the start of the routine in USERV.
70-80	If *CODE, jump to 370.
90-100	Low byte of string in &71, high byte in &72, to be used with indirect indexed addressing later.
110-140	Initialise X and Y. X will point to the stored text in the table at 720 onwards; Y will point to the characters in the string in *LINE.
170-180	If the zero-end byte is met in the stored text, no match of *LINE string can be found, and the error routine at 310 is entered.
190-200	If carriage return in stored text reached, match has been achieved so go to 330.
210-220	Continue looping if next characters compare.
240-290	If not, search for next carriage return in stored text (this marks the end of the current command being searched). When found, increment pointer to step over number code and return to 130.
300-310	Output 'Bad command'.
320-350	Put number code into &70 and return.
360-440	*CODE enters here. Check the contents of &70 and go to the appropriate routine. If contents of &70 are inappropriate, go to error routine at 680.
450-660	Sample output routines to test method works.
680-710	Use of Beeb/Electron BRK handler to print out error message. 100 is a dummy error number; the message must always end with 0.
730-790	Look-up table.
800-890	Test lines.

Run the program and note the output – line 890 should give 'Bad command'. Now press f0 and you should get 'No *LINE'.

You should now be in a position to

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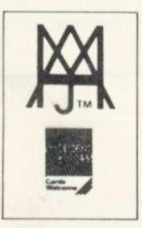
N.B. Requires BBC MICRO MODEL B fitted with version 1.0 operating system, or later.

implement your own new commands using *LINE and *CODE. Particularly original ones will be welcome in the Beeb Forum, so let's hear from you.

Next month I shall look again at the EQU series of commands and discuss how to implement macros, conditional assembly and data tables. ●

```
10DIM START 200
20OSWRCH=&FFEE
30MISTAKE=&E310
40?&200=START MOD 256:
  ?&201=START DIV 256
50FOR I%=0 TO 2
  STEP 2:P%=START
60[OPT I%
70CMP #0
80BEQ CODE
90STX &71
100STY &72
110LDX #255
120.LOOP1
130LDY #255
140.LOOP2
150INX
160INY
170LDA TEXT,X
180BEQ Error
190CMP #13
200BEQ MATCH
210CMP (&71),Y
220BEQ LOOP2
230.LOOP3
240INX
250LDA TEXT,X
260CMP #13
270BNE LOOP3
280INX
290JMP LOOP1
300.Error
310JMP MISTAKE
320.MATCH
330LDA TEXT+1,X
340STA &70
350RTS
360.CODE
370LDA &70
380CMP #1
390BEQ One
400CMP #2
410BEQ TWO
420CMP #3
430BEQ THREE
440JMP NOLINE
450.One
460JMP GRAPH
470.TWO
480JMP GRID
490.THREE
500JMP STAR
510.GRAPH
520LDA #ASC("A")
530JSR OSWRCH
540JMP FINISH
550.GRID
560LDA #ASC("B")
570JSR OSWRCH
580JMP FINISH
590.STAR
600LDA #ASC("C")
610JSR OSWRCH
620JMP FINISH
630.FINISH
640STX &73
650STY &74
660RTS
670.NOLINE
680BRK
690EQUB 100
700EQUS "No *LINE"
710EQUB 0
720.TEXT
730EQUS "GRAPH"
740EQUW &10D
750EQUS "GRID"
760EQUW &20D
770EQUS "STAR"
780EQUW &30D
790EQUB 0:]NEXT
800*KEYO ?&70=0:*CODE5,6|M
810*LINE GRAPH
820*CODE15,200
820PRINT?&73,?&74
830*LINE GRID
840*CODE20
850PRINT?&73,?&74
860*LINE STAR
870*CODE36,39
880PRINT?&73,?&74
890*LINE GRAP
```

Program 1. Sets up three example commands – GRAPH, GRID and STAR



Software News



INNOVATIVE
BBC SOFTWARE

from the professionals



All computer wargames are played in a similar manner, that is to say against the background of a map representing the geography of the time and place in question. On the BBC machines these maps are particularly attractive. The author has taken full advantage of the available resolution and colour.
Also most wargames are played in a similar manner. Troops or whatever are moved from one area to another, taxes are levied and desertions result from a bad commander. In addition, of course, it is necessary to fight battles and win wars — that is what it is all about! Molimerx have the following three wargames available for the BBC machine.

EMPEROR

The time of this wargame is the first four centuries AD. The player takes the part of the Emperor and he must pit his wits and forces against invading barbarians, rebellious provincials and treacherous Roman Generals. Even the Plebs of Rome will have to be placated with bread and circuses if the Emperor is to keep his head and his throne. If he can last out for the first eight years of the game he is judged on the state of the Empire at the end of that time. There are three levels of play. Depending upon his choice, the Emperor has to guide the Empire through the first, third and fourth centuries. To win in the first century he must expand the Empire by two provinces, in the third he must maintain his Empire intact and in the fourth he must lose not more than two Provinces. For each Province the player is given three items of information, the number of loyal Legions, the number of revolting Legions and the number of Barbarian Invaders of Local Rebels. During play Legions must be raised, taxes inflicted and troops moved. The choice of Generals can be very critical — some are loyal and good fighters, some are neither. Battles must be fought and invasions repelled. All the while the citizens in Rome must be kept happy and — you must keep an eye on those Barbarians in Britannia!

CRUSADERS

The scenario of Crusaders is that you are the King of Jerusalem and have to rule your Kingdom from 1169 to 1177. Your ultimate aim is to prevent any incursions by the invading Saracens. You have a total of forty-eight fortresses, all interconnected by caravan routes. The program will pick these off one by one, unless you can defeat the Saracen army in the field, by gathering together an army for yourself from the various garrisons. Each year consists of six (bi-monthly) moves. At the end of each year (at play rating 6), you will find a new Saracen army moves into the Kingdom from enemy territory. All Saracen armies that stay in the field for a year are reduced by desertions.
The program itself has an artificial intelligence, in as much as the Saracens attempt to seige and take castles and fortresses that they have not previously moved to. In this way, a Saracen army that has been seigeing for a few years may be reinforced by a new army, which may be sufficient troops to effect the taking of the fortresses.

NAPOLEON

Napoleon is an excellent wargame in which the player tries to change history by doing better than the great Napoleon Bonaparte himself. The object of the game is to conquer Europe completely. Battle commences in June of 1798, and the player has until the end of 1815 in which to manoeuvre the initial six armies in such a way as to defeat the forces of Britain, Austria, Prussia, Russia, Spain and Portugal. It must have been comparatively nice to do war in those days because the armies only move in the summer months. In the winter they are resting.
The computer controls all of the opposing forces. The player must concentrate on keeping his armies up to strength, finding the enemy, moving his armies to the correct situations and finally, of course, engaging the enemy in battle.
At the beginning of each year the program will raise taxes for you, but on the other side of the ledger, money will be deducted from your Treasury every month to pay your troops. Desertions were rife in the 18th and 19th century wars, so the player must be certain to feed his troops completely or they might defect. Indeed, although the player starts with six armies, any or all of them can be lost by desertions or, of course, by being defeated by the enemy. Once disseminated, an army cannot be re-formed. Similar rules apply to enemy armies which you destroy. As Napoleon is written by an Englishman it is natural that Britain should have one small advantage, which is that the British armies can start in Portugal, Spain or Prussia, or all three. Otherwise, all of the armies of the European countries start off on their own soil.

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DISC AUTOSTART

HERE are two hints on using autostart with discs. First, get a newly-formatted disc, and save the following one line program on it, calling the program TEST:

```
10 REPEAT:INPUT A$:UNTIL FALSE
```

Now use *BUILD !BOOT to obtain the boot file, CHAIN "TEST", and use *OPT4,3 to configure the autostart properly.

Then, program the break key with *KEY10 OLD|M RUN|M, and try shift-break. You will find that OLD and RUN get caught up in the input buffer and are entered into the program as input data!

Since it may sometimes happen that the autostart is used when the break key has been programmed, always include *KEY10 as the first line of your !BOOT file. This will clear the break key.

The second point concerns an annoying aspect of autoboot, which is the inability to boot up the reverse side of a disc when using double-sided drives. However, as long as the boot operation is the same on both sides of the disc there is a way.

Listing 1 shows the details. In this case, Joe Telford's excellent auto-menu program (September's *Acorn User*) is being chained, the program being on both sides of the disc. !BOOT need only be on the 'top' side, however.

Incidentally, I'm sure Joe won't mind me pointing out an improvement to his fine program. As it stands, it won't work properly with locked files, since the top bit of the directory is set to 1. Changing line 450 to:

```
450 Is$=CHR$((?(S+N*L+L-1))MOD
    128)
```

does the trick.

The idea in listing 1 is that the shift key is tested: if it is held down, side B is booted, if not, side A. Thus, to boot side A, press shift-break and then let go of shift: to boot side B press shift-break and keep shift down until the booting occurs.

```
*KEY10
IF INKEY(-1) = TRUE THEN *DR.2
CH."MENU"
```

Listing 1. Shift key tested

MULTI-FUNCTION KEYS by J. Taylor

£10

TWO problems crop up concerning the function keys on the BBC micro; there are too few, and not enough buffer space is allocated to them. Yet there is space below &E00 which is not used by most programmers. The area &900-&AFF is only used for the RS423 port and tape data files, &CØØ-&CFF is only used when characters are redefined and &D00-&DFF is only used with disc drives and other filing systems.

Listing 2 allows you to define up to 40 keys. f0 is used to call a short machine code routine which cycles through four sets of keys stored between &900 and &CFF. The code is very simple and can be easily adapted to accommodate any number of sets of keys located at any page in RAM.

The code is located at &D01 and does not cycle the first byte of each buffer (to avoid problems with the RTI instruction inserted at &D00 when break is pressed on OS1.2. If page &D is required for some other purpose, the code could be relocated at &8D0, assuming no envelopes have been defined.

PROCO must be called before defining each set of keys. This swaps the last set out of the normal key buffer, clears it, and defines f0 via a call to OSCLI, thus saving you the trouble of retyping the definition for each key set and any time you decide to move the position of the code.

You should define each set of keys in the normal way in place of the REMs on lines 160, 190, 220 and 250, but don't use key 0. The program will *SAVE the buffers automatically so you can *LOAD them when required. Press escape to over-ride this.

To test the system, run the program provided, then press escape and f1. The key f1 is defined to display the bottom 8k of RAM continuously, useful if you want to see what happens in the operating system RAM. Then press f0 a few times, and you should see the four buffers swapping position. Press break and type OLD, then press f0 a few more times—the current set of keys should be printed at each stage.

The keys can be swapped from within a program by a call to &D01, and the current key set can be redefined at any time using either a program or direct commands.

The same principle can be used to swap different sets of user-defined characters into page &C.

```
10 REM Multiple function keys
20 REM by J.M.Taylor
30 C%=&D01:REM Machine code address
40 REM Buffers 1-4,base addresses
50 B1=&B00 :B2=&A00
60 B3=&900 :B4=&C00
70
80 P%=C% : [ : OPT 3 : LDY #1
90 .L : LDX B1,Y :LDA B2,Y
100 STA B1,Y : LDA B3,Y
110 STA B2,Y : LDA B4,Y
120 STA B3,Y : TXA : STA B4,Y
130 INY : BNE L : RTS : ]
140
150 DIM X% 30 : Y%=X% DIV 256
160 PROCO(1)
170 REM First key set *KEY1-*KEY10
180
190 PROCO(2)
200 REM Second key set *KEY1-*KEY10
210
220 PROCO(3)
230 REM Third key set *KEY1-*KEY10
240
250 PROCO(4)
260 REM Fourth key set *KEY1-*KEY10
270 *KEY 1 MO.6|M VDU19;4;0;28,0,24,
39,0,23;12;0;0;0;|M
280
290 *SAVE"KEYBUFFS" 900 D20
300 END
310 DEFPROCO(N%) : CALL C% : *FX18
320 $X%="*KEY 0 CA.&"+STR$~C%+"|M P.
""Keys "+STR$(N%)+""""|M"
330 CALL &FFF7 :ENDPROC
```

Listing 2. Program allows 40 function keys to be defined

KEY OSBYTE £5

OSBYTE 202,X,Y accesses the byte which controls the keyboard lock state, and stores <CTRL> and <SHIFT> state from last keystroke. The new value written is (old value AND Y) EOR X, the old value is returned in X.

The apparent functions of the bits of the stored value are:

bit 7 shift-caps lock
6 CTRL was pressed
5 NOT shift lock
4 NOT (caps lock OR SHIFT-caps lock)
3 shift was pressed
2 not used
1 not used
0 not used

So, in answer to the problem from July's Forum 'what does *FX202,32,207 do?' I offer the following.

In binary, X=100000 and Y=11001111, so Y clears the store bits 4 and 5, and X then inverts bit 5. The effect of this is to release shift-lock, and (unless shift-caps lock is set) to set caps lock.

To get into shift-caps lock mode, press <SHIFT> and <CAPS LOCK> together. Then try seeing what shift does to your keyboard! (From Peter Trevethick.)

VDU CURSOR SHAPE by Allen Hardy £5

MOST readers know that VDU 23;8202;0;0;0; turns the cursor off, but there are more useful VDU calls affecting the shape of the cursor, all of which work on any operating system (unlike those given on page 77 of the *User Guide* which work on series 1 only):

- restore cursor (default)—mode 7: VDU 23;29194;0;0;0;
- restore cursor (default)—other modes: VDU 23;26378;0;0;0
- block cursor—all modes: VDU 23;16394;0;0;0;

A block cursor is easier to see when editing as the 'read' cursor (ie that controlled by the edit keys) reverses the character it is reading as it flashes on and off.

The above calls operate by writing to register 10 of the 6845 video controller chip. The following two write to register 11, but the cursor should be restored only by writing to the register by which it was turned off or changed.

- cursor off—all modes: VDU 23;11;0;0;0;
- restore cursor (default)—all modes: VDU 23;65291;0;0;0

In VDU calls, using a semi-colon instead of a comma allows the preceding number to be sent to the VDU drivers as two bytes (least significant first), hence VDU 23;8202; . . . is equivalent to VDU 23,0,10,32, . . . The 8202 is calculated from 10 + 256 × 32, where 10 is the register number and 32 is the value written to it.

Note that if any of these calls are to be used in a function key definition it is much better to use control codes. For example:

```
*KEY n |M|W|@|J |@|@|@
  |@|@|@
```

(note the space after J)

occupies only 11 bytes in page &B, the area of memory containing the key definitions, as compared with the 19 bytes required by its equivalent,

```
*KEY n |MV.23;8202;0;0;0;|M
```

Page 385 of the *User Guide* gives more information on the 6845, and the following page explains the use of semi-colons.

PASS VAR £5

FX calls, by their very nature, will not accept Basic variables. The following procedures allow variables to be passed via the OSBYTE call.

```
DEFPROCFXxy(A%,X%,Y
  %)CALL&FFF4 : ENDPROC
DEFPROCFXx(A%,X%)LOCALY%      :
CALL&FFF4 : ENDPROC
  DEFPROCFX(A%)LOCALX%,Y%     :
CALL&FFF4 : ENDPROC
```

The parameters of a procedure are local to that procedure, and defining a variable as LOCAL gives it a zero value, so the values of A%, X% and Y% are preserved outside each of the above. (From G. Smith)

SOUND IDEA £5

LISTING 4 prints the sound envelopes for the BBC micro. Readers should find it useful for examining the envelopes in any program. (From Mark Winter.)

```
10  REM Envelope examiner
20  REM by Mark Winter
30  IF?F0C5=49THEN
    START=&8B0 ELSE
    START=&800 : REM
    START at &800 for OS
    0.1 and  &8B0 for OS 1.2
35  CLS
40  INPUT"Type
    envelope no. "EN
45  PRINT
50  PRINT"ENVELOPE ";EN;
60  FORI=0TO12
70  PRINT",";?
    (START+EN*16+I);
80  NEXT
90  PRINT
```

Listing 4. Prints sound envelopes for BBC micro

£5 DISC TO TAPE by H. Oostrom

COPYING programs from disc to cassette can be achieved using listing 3. The program is contained in the definition of f0. When you type it in, do so carefully. Do not put in extra spaces or unabbreviated keywords, otherwise you get a 'bad key'. The eight spaces in the second line are essential. If screen instructions are not needed, delete lines 10 to 140.

After pressing f0, the program repeats itself by placing code 128 (f0) in the keyboard buffer. Program names are read from the screen after cataloguing the disc. When no string can be found the program stops by placing 13(return) in the keyboard buffer.

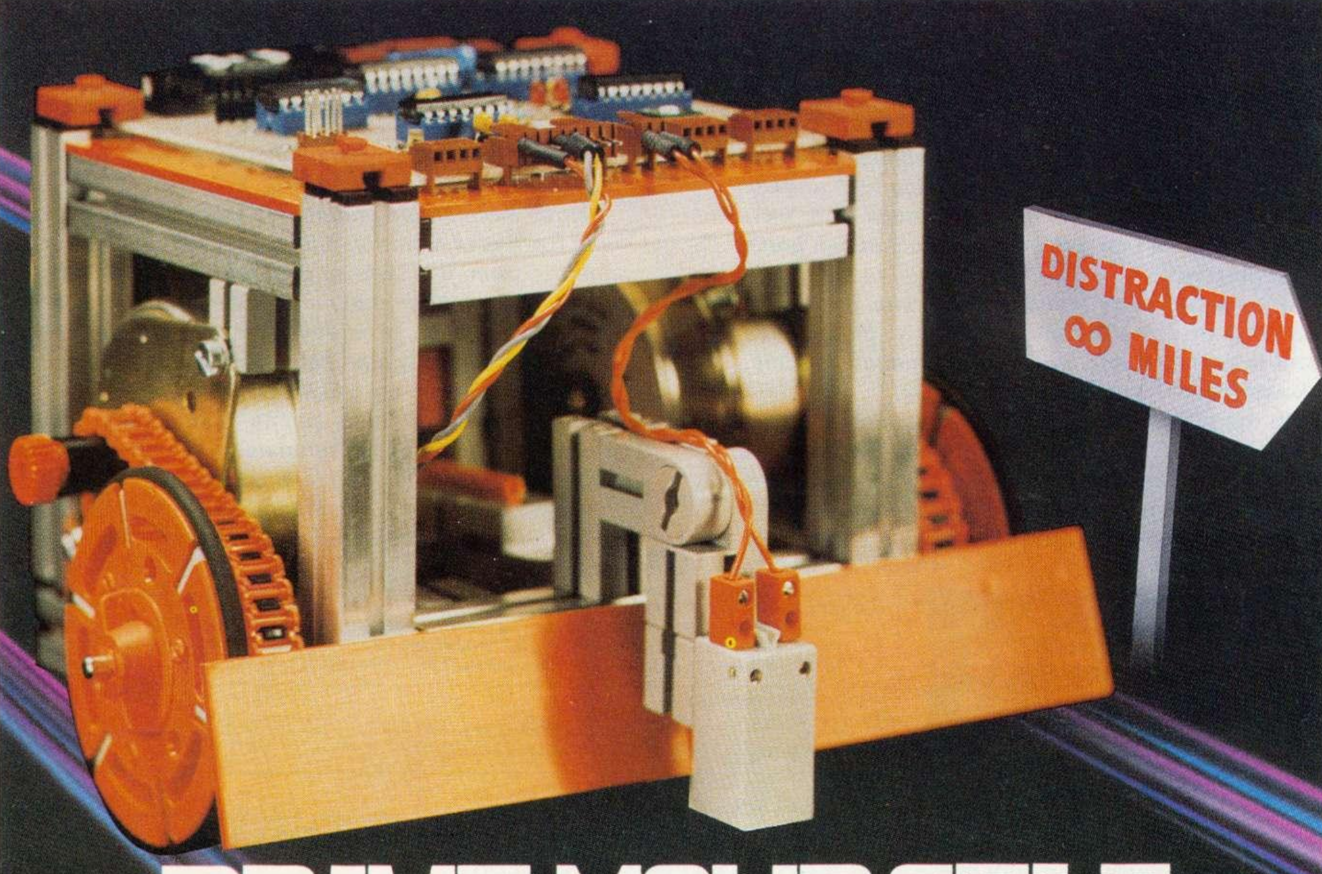
If a tape copy at 300 baud is wanted, the *T. command in the third line of line 170 can be replaced by *T.3

Readers should note a number of problems with this. First, the program will not deal with directories, and will 'hang up' occasionally because the buffer fills up. Also, it does not use the information in pages E and F (Hints & Tips, September) which would be more efficient. Finally, it cannot handle machine code or text.

Nevertheless, this program is worth publishing because it points the way for other readers who should write in with routines to solve all four problems.

```
  10 CLS:PRINT''"This program copies all BASIC programs"
  20 PRINT"on a disc to a cassette tape."
  30 PRINT'"After running this program put a tape"
  40 PRINT"in the recorder and the disc in a"
  50 PRINT"drive. If you have more than one drive"
  60 PRINT"select the right one with *DRIVE."
  70 PRINT'"Then press the RECORD buttons on your"
  80 PRINT"recorder and press f0. Copying will"
  90 PRINT"stop automatically after the last"
 100 PRINT"program."
 110 PRINT'"If you want to copy another disc re-RUN"
 120 PRINT"the program again, or manually reset"
 130 PRINT"S%=4 and T%=5. Then you can press f0"
 140 PRINT"again."
 150 *FX18
 160 S%=4:T%=5
 170 *KEY0*D.|M|L*.|M|MV.21|MA$="":C%=H.+S%+40*T%:F.I%=C%TO
C%+7:A$=A$+CHR.?I%:N.|MIFA$="        "TH.Y%=13EL.Y%=128|MA%=
138:X%=0:CALL&FFF4|MLO.A$|M*T.|MA$="":F.I%=C%TOC%+7:A$=A$+CH
R.?I%:N.|MV.6|MSA.A$|M|MS%=S%+20:IFS%>24TH.S%=4:T%=T%+1|M
 180 END
```

Listing 3. Copying from disc to cassette



DRIVE YOURSELF TO DISTRACTION

WITH A *BBC* BUGGY

Trying to determine the limitations of the BBC Buggy is a task which will drive you to distraction. So sit back and accept the fact that your BBC Micro computer (Model B) controlled Robot will provide you with hours and hours of stimulating entertainment.

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The Buggy's software which is based on the 'building block' principle consists of 12 robust application programs and one familiarisation program all of which feature full graphics.

Take a trip into the future without ever leaving your key-board – drive a BBC Buggy.

PROGRAMS
Test and familiarisation.
Switch – direct computer control.
Memory Switch – demonstrating computer memory.
Routeplanner – advanced version of Snail.
Recorder – route display.
Snail – screen route planning.
Explore for wall – mapping of boundaries.
Explore for object – seeks objects, defines shapes, returns home.
Bar Code Routeplanner – non-keyboard information input.
Tin Pan Alley – composing music by bar codes.
Man vs Buggy – 'Flying blind'.
Sunseeker – seeking a light and negotiating obstructions.
Line Follower – black or white line following.

The BBC Buggy is available from Acorn/BBC dealers and other major outlets.



Economatics, 4 Orgreave Crescent, Dorehouse Industrial Estate, Handsworth, Sheffield S13 9NQ. Tel: Sheffield (0742) 690801.

WELCOME TO A NEW COLUMN BY MARTIN PHILLIPS

THIS problem page is a new, regular feature of *Acorn User*. It will present simple hints and tips and answer readers' queries about the BBC computer and BBC Basic. £5 will be paid for a 'star' letter, so you can profit from your problem!

If you have a query concerning some aspect of programming or some technical difficulty, please give sufficient information and make your question specific. The following query was received recently:

'I am in the middle of writing a program for an exam project on my 32k BBC. However, although the program is only just over 21k long, when it is run the computer prints up the error message 'No room' or 'Dim space'. I would be grateful if you could tell me any methods of running the program successfully without the need to cut the program up.'

Now, there are any number of reasons why a program will run out of memory. Without knowing far more about the program, the style of programming and techniques used, and whether discs and Econet have been fitted, it is impossible to give anything but general hints on memory saving. It also helps to know which operating system and Basic are installed.

So please bear these points in mind and include a listing if possible. Unfortunately, we cannot reply to letters individually, and are unable to return letters, listings, etc. Send your letters to: Hints & Tips, Acorn User, 53 Bedford Square, London WC1B 3DZ.

BUFFER KEY TROUBLES

£5

THE star letter in this first problem page comes from Simon Barry in the Dominican Republic, who has been having trouble with the user-defined key buffer.

Please could you explain the error message 'Bad key' (error code 251). I get this when I attempt to allocate the string search below to any key other than 0.

Furthermore, when this code is inserted as a line in my well-tried initialisation program to set up the keys and move the screen down etc, I get the message 'Bad key' again after four or five keys have been allocated functions.

It is as if the user-definable key area of memory is becoming full, yet the longest key definition is the one detailed in this letter and the others average 15 characters. In addition, investigation directly after the 'Bad key' message, shows that many memory locations in this area remain unused (ie P?LOCATION returns 0).

Original key definition gives error

```
*KEY0"CLS:INPUT""Enter string""N$:P=PAGE+1:REPEAT:N=256*P?0+P?1:
P=P+2:L=P?0:NL=P+L-2:P=P+1:IF INSTR($P,N$)<>0 THEN PRINT;N:P=NL:
UNTIL P?0=&FF:END:ELSE P=NL:UNTIL P?0=&FF:END M"
```

Shortened version

```
*KEY0 "IN.""Enter  string""N$:P=PA.+1:REP.N=256*P?0+P?1:Q=P+3:P=P+P?2:
IFINS.$Q,N$)>0P.N:U.P?0=&FF:EL.U.P?0=&FF L M"
```

```
 10 @%=3
 20 FOR location=&B00 TO &BFF STEP8
 30 PRINT'"&"~location;
 40 B$="  "
 50 FOR line=0 TO 7
 60 peek=location?line
 70 PRINT~peek;
 80 IF peek<32 OR location+line<&B11 peek=46
 90 B$=B$+CHR$(peek)
100 NEXT line
110 PRINT B$
120 NEXT location
```

Program 1. Analyses key buffer, or other memory locations

■ This is an interesting problem which requires a bit of delving into the hidden workings of the user-defined key buffer. The buffer is located at &B00 to &BFF. (The '&' sign indicates a hexadecimal number.) It is only 256 bytes long and the first 16 locations hold the starting position in the buffer for each of the 16 user-defined keys. (Don't forget, as well as f0-f9 and break, using *FX14, copy and the four cursor move keys also act as user keys.) The seventeenth location holds the first vacant position left in the store. The buffer can therefore hold only 239 characters. It stores the definitions almost exactly as they are defined.

On power-up, each location holds the value 16, so Simon must have been looking past the end of the buffer. However, he was right, the buffer was running out of space – the 'Bad key' message is printed when this occurs. The reason he could not allocate his program to key1 was that he had already assigned the program to key0, and there was not enough room left to allocate it to key1 as well. To clear the buffer, use *FX18.

What can be done to help Simon? If the buffer is not long enough, then the key definitions must be kept short. His program can be reduced substantially.

This saving in space in the key buffer can be achieved by the following methods:

- replace CLS by L.
- use abbreviations. Basic statements are not tokenised in the buffer as they are in a normal program. (See *User Guide* for list of abbreviations.)
- delete unnecessary words such as THEN and END.
- delete unnecessary spaces.
- avoid repetition, P=NL is repeated. (If the repetition is avoided NL is not needed at all.)
- avoid unnecessary calculations.

To round off, program 1 can be used to look at the way the buffer stores the key definitions. Simply by changing the start and end points in line 20, other memory areas can be investigated.

Description of program: 10 Set print format to 3; 20 Loop to cycle through buffer eight locations at a time; 20 Print memory location at start of each line. The semicolon will stop the print statement going to a new line after printing; 30 Set B$, the string that will contain the ASCII characters, to contain two spaces; 50 Loop to print out a line of locations; 60 Look at memory location (location+line) and store in variable 'peek'. This is called 'peeking', hence the variable name; 70 Print out value in hexadecimal; 80 If the memory location is less than &B11 or if the ASCII value is less than 32, let 'peek' take the ASCII value for a dot instead. &B11 is 17 locations into the buffer. These first 16 locations store the starting point in the buffer for each key and location 17 stores the first free space in the buffer. If a number less than 32 is converted to an ASCII code, all sorts of odd effects could happen; 90 Add the ASCII character onto the end of B$.

```
&B00 10 76 76 76 76 76 76 76  ........
&B08 76 76 76 76 76 76 76 76  ........
&B10 76 49 4E 2E 22 45 6E 74  .IN."Ent
&B18 65 72 20 73 74 72 69 6E  er strin
&B20 67 22 4E 24 3A 50 3D 50  g"N$:P=P
&B28 41 2E 2B 31 3A 52 45 50  A.+1:REP
&B30 2E 4E 3D 32 35 36 2A 50  .N=256*P
&B38 3F 30 2B 50 3F 31 3A 51  ?0+P?1:Q
&B40 3D 50 2B 33 3A 50 3D 50  =P+3:P=P
&B48 2B 50 3F 32 3A 49 46 49  +P?2:IFI
&B50 4E 53 2E 24 51 2C 4E 24  NS.$Q,N$
&B58 29 3E 30 50 2E 4E 3A 55  )>0P.N:U
&B60 2E 50 3F 30 3D 26 46 46  .P?0=&FF
&B68 3A 45 4C 2E 55 2E 50 3F  :EL.U.P?
&B70 30 3D 26 46 46  C  D 10  0=&FF...
&B78 10 10 10 10 10 10 10 10  ........
&B80 10 10 10 10 10 10 10 10  ........
&B88 10 10 10 10 10 10 10 10  ........
&B90 10 10 10 10 10 10 10 10  ........
&B98 10 10 10 10 10 10 10 10  ........
&BA0 10 10 10 10 10 10 10 10  ........
```

```
&B00 10 B5 B5 B5 B5 B5 B5 B5
&B08 B5 B5 B5 B5 B5 B5 B5 B5  ........
&B10 B5 43 4C 53 3A 49 4E 50  ........
&B18 55 54 22 45 6E 74 65 72  .CLS:INP
&B20 20 73 74 72 69 6E 67 22  UT"Enter
&B28 4E 24 3A 50 3D 50 41 47   string"
&B30 45 2B 31 3A 52 45 50 45  N$:P=PAG
&B38 41 54 3A 4E 3D 32 35 36  E+1:REPE
&B40 2A 50 3F 30 2B 50 3F 31  AT:N=256
&B48 3A 50 3D 50 2B 32 3A 4C  *P?0+P?1
&B50 3D 50 3F 30 3A 4E 4C 3D  :P=P+2:L
&B58 50 2B 4C 2D 32 3A 50 3D  =P?0:NL=
&B60 50 2B 31 3A 49 46 20 49  P+L-2:P=
&B68 4E 53 54 52 28 24 50 2C  P+1:IF I
&B70 4E 24 29 3C 3E 30 20 54  NSTR($P,
&B78 48 45 4E 20 50 52 49 4E  N$)<>0 T
&B80 54 3B 4E 3A 50 3D 4E 4C  HEN PRIN
&B88 3A 55 4E 54 49 4C 20 50  T;N:P=NL
&B90 3F 30 3D 26 46 46 3A 45  :UNTIL P
&B98 4E 44 3A 45 4C 53 45 20  ?0=&FF:E
&BA0 50 3D 4E 4C 3A 55 4E 54  ND:ELSE
&BA8 49 4C 50 3F 30 3D 26 46  P=NL:UNT
&BB0 46 3A 45 4E 44  D 10 10  ILP?0=&F
&BB8 10 10 10 10 10 10 10 10  F:END
&BC0 10 10 10 10 10 10 10     .
```

Results of using buffer analysis program. Notice difference in lengths of code

DATA ENTRY AND SCORES

HERE'S a letter from L. Dial of Great Eccleston on entering data quickly into a program.

I use my BBC to file test scores in a school, but entering a large amount of numeric data in such lines of DATA is difficult on the BBC. I have overcome the problem by using the function keys to bring the comma, delete and return keys nearer the numbers as follows:

```
*KEY0 ","
*KEY7 M DATA
*KEY4 ?
```

I then begin with AUTO 1000 followed by f7. Once begun, my fingers never leave the number key area and my eyes stay on the copy. Data entry is then quick.

■ This tip will save time, but I wonder why this reader has chosen to enter the scores into DATA statements? Many teachers are using their computers to enter marks and store them, and the best way to do this is to use arrays.

Arrays are guaranteed to send a shudder down most people's backs, but they are not all that hard. Take an example of a class of children and a list of marks for different subjects. (I would strongly advise using small numbers (program 2) when experimenting to avoid having to keep retyping large amounts of data each time the program meets an unexpected error!) It is simple to increase the numbers once the program runs correctly. The first part of the program (lines 10-110) sets the size of the arrays, enters each child's name and the subjects.

```
10 INPUT"Enter number of
   children "numchil
20 INPUT"Enter number of
   subjects "numsub
30 DIM name$(numchil),
   subject$(numsub),
   scores(numchil,numsub)
40 FOR N=1 TO numchil
50 PRINT"Enter name of child ";N;
60 INPUTname$(N)
70 NEXT N
80 FOR N=1 TO numsub
90 PRINT"Enter name
   of subject ";N;
100 INPUTsubject$(N)
110 NEXT N
120 FOR N=1 TO numchil
130 PRINT name$(N)
140 FOR T=1 TO numsub
150 PRINT"Enter mark for
    "subject$(T)
160 INPUTscores(N,T)
170 NEXT T
180 NEXT N
190 FOR N=1 TO numchil
200 PRINT''name$(N);
210 FOR T=1 TO numsub
220 PRINTscores(N,T);
230 NEXT T
240 NEXT N
```

Program 2. Illustrates arrays with classroom records

Now the marks for each of the three subjects need to be entered. This can be done in two ways. Either all the marks can be entered for each child in turn, or all the marks for each subject in turn can be entered. We shall use the former in this example, and lines 120-180 do this.

Now we want to be able to print the scores out. Again this can be done two ways, by name of subject. The simple outline printout (lines 190-240) can be improved by using the subject headings and paying attention to print formatting.

Data stored in arrays can be saved on tape or disc, and I advise studying the chapter on cassette files in the *User Guide*.

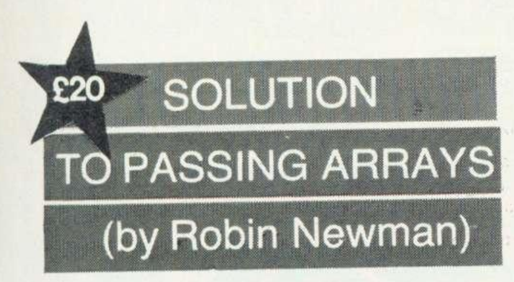
ERROR TIPS

■ When typing in a program, if the program joins the text and graphics cursors using VDU5, and you try to list what you have entered after running the program, the text will overwrite itself. A simple 'cure' is to program the break key to list the program with page mode on in mode 7:

```
*KEY10 OLD M L LIST M
```

This is also useful if you want to list a program that uses mode 5 or mode 1.

■ If a program you are typing in has the ON ERROR statement set to return to a part of the program should an error occur, don't insert it until you are sure the program runs correctly. Otherwise every time a mistake occurs the program will go back to the same point and you will be left wondering why the program will not run.



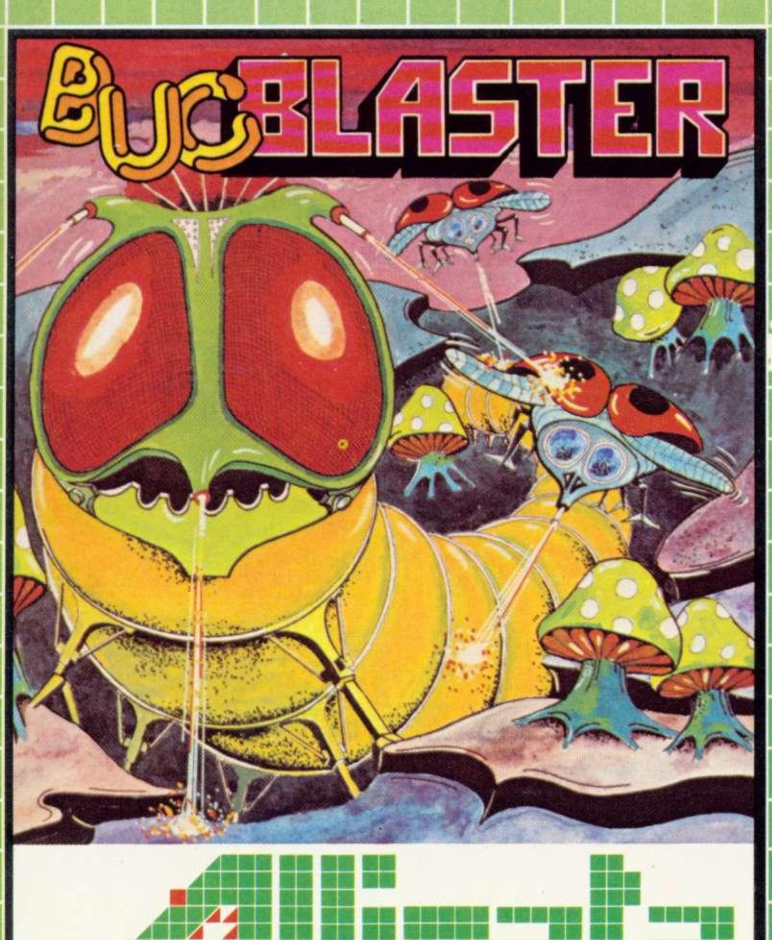
HAVING read the article by Rob Alecio on passing arrays as parameters to procedures (July, p44), readers might be interested in another solution to this problem written in assembler. It is similar in technique, and allows up to 10 separate arrays to be used at one time in this manner. I have successfully used it for a year in programs involving 3D transformations which rely very heavily on matrix manipulations.

A fascinating idea which I'm sure will have many other applications. Readers with routines which build on this should write in—IB.

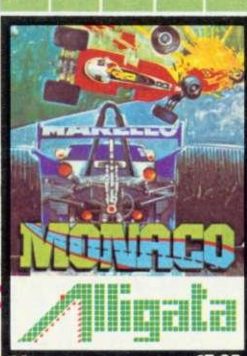
```
10REM** Program by Robin Newman,
20REM** Dept. of Microelectronics
30REM** Oundle School.
40REM**
50REM** This program shows how it is
60REM** possible to alter the value
70REM** of variables passed as
80REM** parameters to a PROCedure.
90REM** The same technique can be used
100REM** to pass an entire array as a
110REM** parameter to a PROCedure
120REM** without having to enumerate
130REM** each element separately.
140REM** It works by commoning
150REM** all variables starting with
160REM** two different letters:- eg B
170REM** and P. (note B% and P% are
180REM** NOT commoned).
190REM** The PROC is written using
200REM** using dummy variables which
210REM** are replaced with their
220REM** commoned counterparts. After
230REM** exiting from the PROCedure,
240REM** the variables are separated
250REM** again. At present up to ten
260REM** different pairs of variables
270REM** may be commoned, which
280REM** should be ample for most
290REM** needs. Variable names
300REM** starting with a-z lower case
310REM** have not been allowed for.
320REM**
330REM** Set up COMMON and SEPARATE routines
340PROCSETUP
350DIM F(10),Z(10)
360REM** Set up initial values for
370REM** variables, including arrays.
380REM** Array F defaults to zero.
390D=1:Y=2
400FOR I%=1TO 10:Z(I%)=I%:NEXT I%
410CLS
420PRINTTAB(10);"INITIALLY"'
430PROCprintvalues:REM** Print variables
440REM** Now 'common' all 'Z' variables
450REM** with their 'F' equivalents
460REM** (except for F% and Z%)
470REM** A% points to position in list
480REM** where variable pointers will
490REM** be stored. The same value is
500REM** used when the two variables
510REM** concerned are to be separated.
520A%=1:CALL COMMON,F%,Z%
530REM** Now common 'Y' with 'D'
540REM** and store in list position 2.
550A%=2:CALL COMMON,D%,Y%
560REM** Call the PROC which will alter
570REM** the values of the 'commoned' variables
580PROCAltervalues
590REM** Now separate 'Z' and 'F' again
600A%=1:CALL SEPARATE
610REM** Now separate 'Y' and 'D' again
620A%=2:CALL SEPARATE
630PRINT'"After the variables have been separated"'
640PROCprintvalues
650PRINT''TAB(10);"END OF PROGRAM"
660END
670DEFPROCSETUP
680REM** This sets up M/Code to allow
690REM** variables to be commoned and
700REM** separated again.
710INDEX=&70:BASE=&6E
720DIMP%&4A
730 [OPTO
740.COMMON
750STA INDEX
760ASL A
770CLC
780ADC INDEX
790TAY
800LDA &604
810LSR A
820CLC
830ADC £&80
840STA BASE,Y
850TAX
860LDA &400,X
870STA BASE+1,Y
880LDA &401,X
890STA BASE+2,Y
900LDA &601
910LSR A
920CLC
930ADC £&80
940TAY
950LDA &400,Y
960STA &400,X
970LDA &401,Y
980STA &401,X
990RTS
1000.SEPARATE
1010STA INDEX
1020ASL A
1030CLC
1040ADC INDEX
1050TAY
1060LDA BASE,Y
1070TAX
1080LDA BASE+1,Y
1090STA &400,X
1100LDA BASE+2,Y
1110STA &401,X
1120RTS
1130]
1140ENDPROC
1150DEFPROCAltervalues
1160LOCAL I%
1170FOR I%=1 TO 10
1180Z(I%)=2*I%
1190NEXT I%
1200Y=32
1210PRINT'"At the end of PROCAltervalues, with
    the"'"variables still commoned."'
1220PROCprintvalues:REM** Print variables
1230ENDPROC
1240DEFPROCprintvalues
1250PRINT"The values of the variables are:-"'
1260PRINT"D = ";D;TAB(20);"Y = ";Y'
1270PRINT"Array F:-";TAB(20);"Array Z:-"
1280FOR I%=1 TO 10
1290PRINT;F(I%);TAB(20);Z(I%)
1300NEXT
1310PRINT''TAB(5);"PUSH SPACE BAR TO CONTINUE"
1320REPEAT UNTIL GET$=" "
1330CLS
1340ENDPROC
```

Machine code program passes arrays as parameters to procedures. Note difference between 1(one) and I

EXPLORE THE CRAZY WORLD OF BUGBLASTING but watch out for Brian



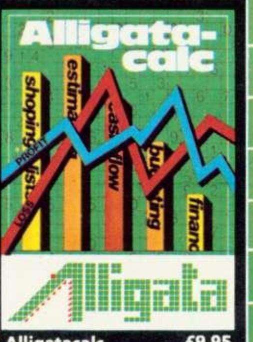
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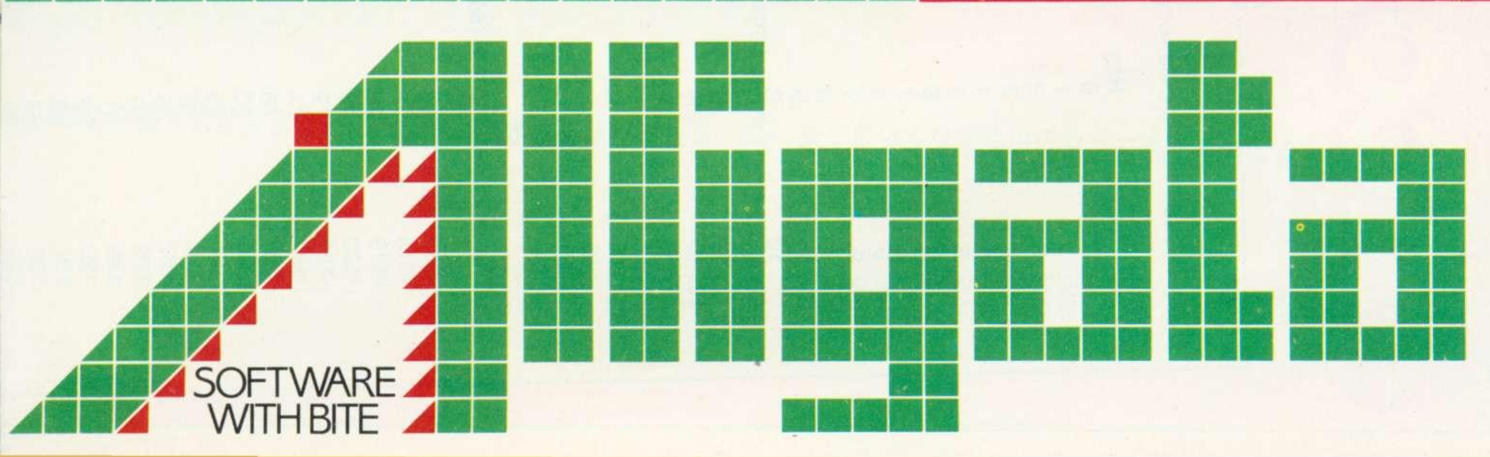
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OSBYTE/*FX calls summary

Dec	Hex	Function
0	0	Print operating system version
1	1	User OSBYTE call, read/write location &281
2	2	Select input stream
3	3	Select output stream
4	4	Enable/disable cursor editing
5	5	Select printer destination
6	6	Set character ignored by printer
7	7	Set RS423 baud rate for receiving data
8	8	Set RS423 baud rate for data transmission
9	9	Set flashing colour mark state duration
10	A	Set flashing colour space state duration
11	B	Set keyboard auto-repeat delay interval
12	C	Set keyboard auto-repeat rate
13	D	Disable events
14	E	Enable events
15	F	Flush selected buffer class
16	10	Select ADC channels to be sampled
17	11	Force an ADC conversion
18	12	Reset soft keys
19	13	Wait for vertical sync
20	14	Explode soft character RAM allocation
21	15	Flush specific buffer

Calls 22 (&15) to 116 (&74) not used by OS

117	75	Read VDU status
118	76	Reflect keyboard status in LEDs
119	77	Close any SPOOL or EXEC files
120	78	Write current keys pressed information
121	79	Perform keyboard scan
122	7A	Perform keyboard scan for 16 (&10)
123	7B	Inform OS, printer driver going dormant
124	7C	Clear ESCAPE condition
125	7D	Set ESCAPE condition
126	7E	Acknowledge detection of ESCAPE condition
127	7F	Check for EOF on an open file
128	80	Read ADC channel or get buffer status
129	81	Read key with time limit
130	82	Read machine high order address
131	83	Read top of OS RAM address (OSHWM)
132	84	Read bottom of display RAM address (HIMEM)
133	85	Read bottom of display address for given mode
134	86	Read text cursor position

190	BE	Read ADC conversion type
191	BF	Read/write RS423 use flag
192	C0	Read RS423 control flag
193	C1	Read/write flash counter
194	C2	Read/write mark period count
195	C3	Read/write space period count
196	C4	Read/write keyboard auto-repeat delay
197	C5	Read/write keyboard auto-repeat period
198	C6	Read/write *EXEC file handle
199	C7	Read/write *SPOOL file handle
200	C8	Read/write ESCAPE, BREAK effect
201	C9	Read/write Econet keyboard disable
202	CA	Read/write keyboard status byte
203	CB	Read/write RS423 handshake extent
204	CC	Read/write RS423 input suppression flag
205	CD	Read/write cassette/RS423 selection flag
206	CE	Read/write Econet OS call interception status
207	CF	Read/write Econet OSRDCH interception status
208	D0	Read/write Econet OSWRCH interception status
209	D1	Read/write speech suppression status
210	D2	Read/write sound suppression status
211	D3	Read/write BELL channel
212	D4	Read/write BELL envelope number/amplitude
213	D5	Read/write BELL frequency
214	D6	Read/write BELL duration
215	D7	Read/write startup message and !BOOT options
216	D8	Read/write length of soft key string
217	D9	Read/write number of lines printed since last page
218	DA	Read/write number of items in VDU queue
219	DB	Read/write TAB character value
220	DC	Read/write ESCAPE character value
221	DD	Read/write character &C0 to &CF status
222	DE	Read/write character &D0 to &DF status
223	DF	Read/write character &E0 to &EF status
224	E0	Read/write character &F0 to &FF status
225	E1	Read/write function key status
226	E2	Read/write SHIFT+function key status
227	E3	Read/write CTRL+function key status
228	E4	Read/write CTRL+SHIFT+function key status
229	E5	Read/write ESCAPE key status
230	E6	Read/write flags determining ESCAPE effects
231	E7	Read/write IRQ bit mask for user 6522
232	E8	Read/write IRQ bit mask for 6850
233	E9	Read/write IRQ bit mask for system 6522
234	EA	Read flag indicating Tube presence
235	EB	Read flag indicating speech processor presence
236	EC	Read/write write character destination status
237	ED	Read/write cursor editing status
238	EE	Read/write location &27E, not used by OS 1.20
239	EF	Read/write location &27F, not used by OS 1.20
240	F0	Read/write location &280, not used by OS 1.20
241	F1	Read/write location &281, used by *FX 1
242	F2	Read RAM copy of serial processor ULA
243	F3	Read/write timer switch state

133	85	Read bottom of display RAM address (HIMEM)
134	86	Read bottom of display address for given mode
135	87	Read text cursor position (POS and VPOS)
136	88	Read character at cursor position
137	89	Perform *CODE
138	8A	Perform *MOTOR
139	8B	Insert value into buffer
140	8C	Perform *OPT
141	8D	Perform *TAPE
142	8E	Perform *ROM
143	8F	Enter language ROM
144	90	Issue paged ROM service request
145	91	Perform *TV
146	92	Get character from buffer
147	93	Read from FRED, 1 MHz bus
148	94	Write to FRED, 1 MHz bus
149	95	Read from JIM, 1 MHz bus
150	96	Write to JIM, 1 MHz bus
151	97	Read from SHEILA, mapped I/O
152	98	Write to SHEILA, mapped I/O
153	99	Examine buffer status
154	9A	Insert character into input buffer
155	9B	Write to video ULA control register and copy
156	9C	Write to video ULA palette register and copy
157	9D	Read/write 6850 control register and copy
158	9E	Fast Tube BPUT
159	9F	Read from speech processor
160	A0	Write to speech processor
		Read VDU variable value

Calls 161 (&A1) to 165 (&A5) not used by OS

166	A6	Read start address of OS variables (low byte)
167	A7	Read start address of OS variables (high byte)
168	A8	Read address of ROM pointer table (low byte)
169	A9	Read address of ROM pointer table (high byte)
170	AA	Read address of ROM information table (low byte)
171	AB	Read address of ROM information table (high byte)
172	AC	Read address of key translation table (low byte)
173	AD	Read address of key translation table (high byte)
174	AE	Read start address of OS VDU variables (low byte)
175	AF	Read start address of OS VDU variables (high byte)
176	B0	Read/write CFS timeout counter
177	B1	Read/write input source
178	B2	Read/write keyboard semaphore
179	B3	Read/write primary OSHWM
180	B4	Read/write current OSHWM
181	B5	Read/write RS423 mode
182	B6	Read character definition explosion state
183	B7	Read/write cassette/ROM filing system switch
184	B8	Read RAM copy of video ULA control register
185	B9	Read RAM copy of video ULA palette register
186	BA	Read/write ROM number active at last BRK (error)
187	BB	Read/write number of ROM socket containing Basic
188	BC	Read current ADC channel
189	BD	Read/write maximum ADC channel number

242	F2	Read RAM copy of serial processor ULA
243	F3	Read/write timer switch state
244	F4	Read/write soft key consistency flag
245	F5	Read/write printer destination flag
246	F6	Read/write character ignored by printer
247	F7	Read/write first byte of BREAK intercept code
248	F8	Read/write second byte of BREAK intercept code
249	F9	Read/write third byte of BREAK intercept code
250	FA	Read/write location &28A, not used by OS 1.20
251	FB	Read/write location &28B, not used by OS 1.20
252	FC	Read/write current language ROM number
253	FD	Read/write last BREAK type
254	FE	Read/write available RAM
255	FF	Read/write start up options

VDU codes summary

Dec	Hex	CTRL	+bytes	Function
0	0	—	0	Not used
1	1	A	1	Send next character to printer only
2	2	B	0	Enable printer
3	3	C	0	Disable printer
4	4	D	0	Write text at text cursor
5	5	E	0	Write text at graphics cursor
6	6	F	0	Enable VDU drivers
7	7	G	0	Make a short bleep
8	8	H	0	Move cursor back one character
9	9	I	0	Move cursor forward one character
10	A	J	0	Move cursor down one line
11	B	K	0	Move cursor up one line
12	C	L	0	Clear text area
13	D	M	0	Carriage return
14	E	N	0	Paged mode on
15	F	O	0	Paged mode off
16	10	P	0	Clear graphics area
17	11	Q	1	Define text colour
18	12	R	2	Define graphics colour
19	13	S	5	Define logical colour
20	14	T	0	Restore default logical colours
21	15	U	0	Disable VDU drivers or delete current line
22	16	V	1	Select screen mode
23	17	W	9	Re-program display character
24	18	X	8	Define graphics window
25	19	Y	5	PLOT K,X,Y
26	1A	Z	0	Restore default windows
27	1B	[	0	ESCAPE value
28	1C	/	4	Define text window
29	1D	]	4	Define graphics origin
30	1E	*	0	Home text cursor to top left of window
31	1F	—	2	Move text cursor to X,Y.
127	7F	DEL	0	Backspace and delete

We would like to acknowledge Mark Holmes, Adrian Dickens and Andrew Bray, authors of *The Advanced User Guide* for their help in compiling this table

PULL OUT

OVERLAYS SAVING BYTES

Patrick Quick describes a simple technique whereby program sections use the same memory area

WOULDN'T it be nice to be able to write large programs and not worry about memory usage? Several educational programs I have written recently have used up almost every available byte—which is a big worry when it comes to converting them to discs, because the disc filing system (DFS) uses up another 3k. With some programs the problem was data storage so the obvious way out was to redesign the data storage to use discs rather than RAM. However, the problem with many of the programs was text for printing.

While designing *Adventure Island* for example, the wording of all messages had been chosen carefully for maximum educational benefit. When programmed into a BBC micro (model B using cassette and mode 7) it would not fit. So I began hacking bits off it—especially the beautifully-designed text. Eventually it was trimmed so it would run reliably through all sections. What was needed for the disc version was a way to cut the effective size of the program itself. I toyed with the idea of storing the text on disc. This would have solved the problem, but only at the expense of major reprogramming (and re-testing!). In the end I decided to use disc 'overlays'.

The idea of an overlay is simple. A program is broken up into a main portion plus several subsections. The main portion contains the overall logic of the program and all the commonly used procedures and functions. The subsections are independent units only needed one at a time. The main portion stays in memory all the time the program is running, whereas the separated subsections ('overlays') are stored on disc. If one is needed it is loaded into a reserved area of memory (overlaid) and then used.

The advantage is that only one area of memory (as big as the biggest overlay) is needed for *all* the overlays. The main disadvantage is that it takes time to load each overlay from disc (you would *not* use overlays with a tape system). Another disadvantage is that when an overlay is loaded it uses the same memory as the previous one. Therefore one thing to remember when splitting a program up is that one overlay should not call another. Lastly, there is the need for software to control the loading of overlays when required. On mainframe computers this is usually in the operating system and language software, and the programmer may hardly notice the overlays. But the Beeb needs its own overlay loader.

The original cassette version of *Adventure Island* was &5A blocks long. After splitting, the main portion was &1A blocks long and the largest of the 24 overlays was &7 blocks long, so &A00 was perfectly adequate for the overlay area.

On a Beeb it is possible to append one program from disc or cassette onto one already in RAM, and many ways of doing this have been published. To understand them, you need to know how programs are stored. Each program line is stored in the same way (figure 1). The first byte is &0D (carriage return or CR) followed by two bytes which give the line number (high-byte first, then low-byte) followed by a single byte giving the total length of the line in memory, and finally there is the actual text of the line (in tokenised Basic). The end of a program is signalled by a line number whose high-byte is over 127 (which is why you cannot have a line number over 32,000). Hence, we have:

```
CR HI LO LEN text. . .
CR HI LO LEN text. . .
. . .
etc
. . .
CR HI LO LEN text. . .
CR &FF
```

If you load another program starting at the last CR, the new program will seem to be a continuation of the old one. Note that if the line numbers in the appended program are not all higher than in the original program, GOTOs and GOSUBs may not work. Now the pointer TOP normally contains the address of the first free byte after the &FF at the end of the program. So if you *LOAD the extra program into the address given by TOP-2 it will be appended. TOP will be reset if OLD or LIST are used or if an error occurs. If you are appending one program onto another, you type OLD to reset TOP and the other pointers. However, when loading an overlay while running a program, you do *not* want the pointers reset.

The other problem is to ensure the overlay area is not used for anything else. Normally the memory just above a problem is used for variable storage. The pointer for the start of this area is LOMEM, which usually has the same value as TOP. The way to reserve space here is to set LOMEM higher than TOP (figure 1). This must be done as the first command in the program (before any variables are used—except the system variables, A% etc). How much space you need to reserve depends on the biggest overlay. You can find out an overlay's size once on disc with the *INFO command. (The size will be given in hexadecimal.) Be generous with the overlay area. You will probably be saving lots of room anyway and may want to add larger overlays later. So for the *Adventure Island* overlays, I used:

```
10 LOMEM=TOP+&A00
```

To prevent problems with TOP being reset (see below) it is a good idea to keep the value in one of the resident system variables, such as T%:

```
20 T% = TOP
```

To load in an overlay you need to issue a *LOAD command with variable load address and filename. To do this, construct a string containing the command in memory and call the OSCLI (operating system command line interpreter—*User Guide* page 463). I have used memory starting at &900 as this is a cassette data buffer not used by the disc system. The name of the file to load is stored in F$ in the following example. To make it easier to recognise overlays

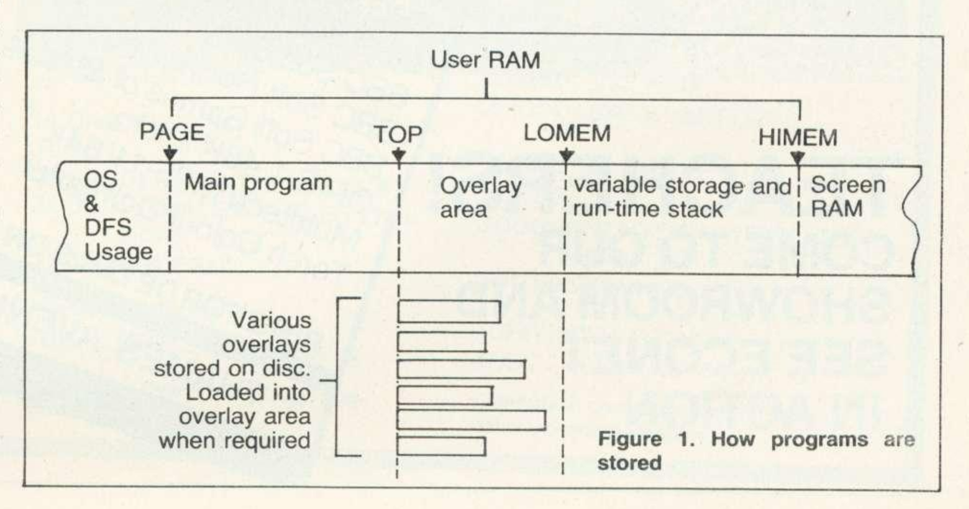


Figure 1. How programs are stored

on a disc I have stored them all in directory O.

```
29020 $&900="LOAD O."
   "+F$+" "
   "+STR$~(T%-2)
29030 Y% = 9
29040 X% = 0
29050 CALL &FFF7
```

Once the overlay has been loaded it then needs to be accessed and used.

What I did was to make lines 29000-29999 a procedure called PROCOVLY. This takes one parameter, the overlay name. All the overlays are renumbered to go from 30000 upwards. Line 29050 as above is the last line in the main program. Once the overlay has been loaded it is automatically executed as the next part of the program. This does not allow you to pass parameters to the overlay in the normal BBC Basic manner.

A second approach would be to load the overlay as one operation and then call the procedure or function you wanted as a separate action. This is cumbersome, but gives the opportunity to pass parameters to the overlay. To do this, just end PROCOVLY in the main program:

```
29060 ENDPROC
```

A really sophisticated technique would be to intercept the error vector. All the overlays would be procedures or functions and when they were called an error would occur which could be recognised by a machine code routine. The routine would then load the appropriate overlay and allow the program to continue.

As suggested earlier, there can be problems with TOP being reset. This will not be a problem when your program works perfectly, but will be infuriating while developing and testing it. What happens is that you load the main program, modify it slightly and then test-run it. If an error occurs, or you escape from the program, or the program ends normally, TOP will be reset to include the last overlay used in the main program. If you run it again, any further overlays will be added after the new TOP and will probably not work! To combat this an extra line is included which gives the option of removing any overlay from the program. Line 29010 (in the final listing) puts back the &FF which originally signalled the end of the main program. It uses the value T% which is not affected when TOP is accidentally reset. To use this feature, call PROCO with a blank overlay name, for example,

```
PROCOVLY (" ")
```

This can be done within the program or directly from the keyboard. It must *not* be done before runnng the current version of the main program or T% will contain the wrong value and the wrong location will be affected, with unpredictable results.

As most large programs need to be highly modular, it should not be too difficult deciding which bits to split off as overlays. If you have already written a program for cassette and wish to split it up, here are some tips.

The DELETE command in BBC Basic is inefficient when used with long programs. The quickest way to separate sections is to *SPOOL them onto disc. For each one type:

```
>*SPOOL X1 (or whatever filename)
>LIST1000,1499 (or whatever line range)
>*SPOOL
```

Then NEW the main program and *EXEC each of the sections into memory, one at a time. When a section is in memory on its own, RENUMBER30000 will put the line numbers in the correct range for an overlay. You will then need to ensure the overlay handles itself correctly and ends with an ENDPROC statement (if you have made your overlays into procedures as I have). Now just SAVE the overlay as 'O. something' and it is ready to use. If the section was a procedure already there should not be much problem in calling it in the main program.

Listing 1 is a complete listing of PROCOVLY plus the initial lines to protect the overlay area and store the value of TOP.

NOTE! There must not be any lines after line 29050 in the main program if you want the overlay executed as part of PROCOVLY.

The overlays may include functions and procedures as required. Sometimes a procedure or function contained in one overlay is needed by another overlay. In this case you must either include it in each overlay which needs it, or move it into the main body of the program. Listings 2 and 3 give examples of using overlays.

```
   10 LOMEM = TOP+&A00

   20 T%=TOP

..... ...

..... ...

29000 DEF PROCOVLY(F$)

29010 IF F$ = "" THEN
      ?(T%-1) = &FF :
      ENDPROC

29020 $&900 = "LOAD O.
      "+F$+" "+STR$~
      (T%-2)

29030 Y% = 9

29040 X% = 0

29050 CALL &FFF7

      and, possibly:-

29060 ENDPROC
```

Listing 1. PROCOVLY plus protection

```
>LOAD"TEST1"
>LIST
   10 LOMEM = TOP+&A00
   20 T%=TOP
   30PROCOVLY("TEST1")
   40PROCTEST1("JUST")
  100END
29000 DEF PROCOVLY(F$)
29010 IF F$ = "" THEN
      ?(T%-1) = &FF :
      ENDPROC
29020 $&900 = "LOAD O.
      "+F$+" "+STR$~
      (T%-2)
29030 Y% = 9
29040 X% = 0
29050 CALL &FFF7
29060 ENDPROC

>LOAD"O.TEST1"
>LIST
30000DEFPROCTEST1(S$)
30010PRINTS$" TESTING
      MARK 1"
30020ENDPROC

>CHAIN"TEST1"
JUST TESTING MARK 1
```

Example 1. Overlay is loaded and called separately.

```
>LOAD"TEST2"
>LIST
   10 LOMEM = TOP+&A00
   20 T%=TOP
   25S$="JUST"
   30PROCOVLY("TEST2")
  100END
29000 DEF PROCOVLY(F$)
29010 IF F$ = "" THEN
      ?(T%-1) = &FF :
      ENDPROC
29020 $&900 = "LOAD O.
      "+F$+" "+STR$~
      (T%-2)
29030 Y% = 9
29040 X% = 0
29050 CALL &FFF7

>LOAD"O.TEST2"
>LIST
30000PRINTS$" TESTING
      MARK 2"
30010ENDPROC

>CHAIN"TEST2"
JUST TESTING MARK 2
```

Example 2. Overlay is loaded and called as one operation.

The quality of educational software still varies dramatically. Here, our reviewers tackle seven packages – from 'sheer waste of money' to good value. Use of BBC facilities, documentation and presentation are worth studying before you buy

CLOCK ON FOR PRACTICE

Timeman One, Bourne Educational Software, model B, £8.97 (£10.99 disc)

THIS package consists of a single tape with a small well-printed teacher's booklet. There are two 'files' we are told (now this is where my primary school colleagues get worried – 'program' will do quite well). The loading instructions are very clear, even for those schools which have a disc drive and/or tape. The program is 'menu driven', and each section is well explained.

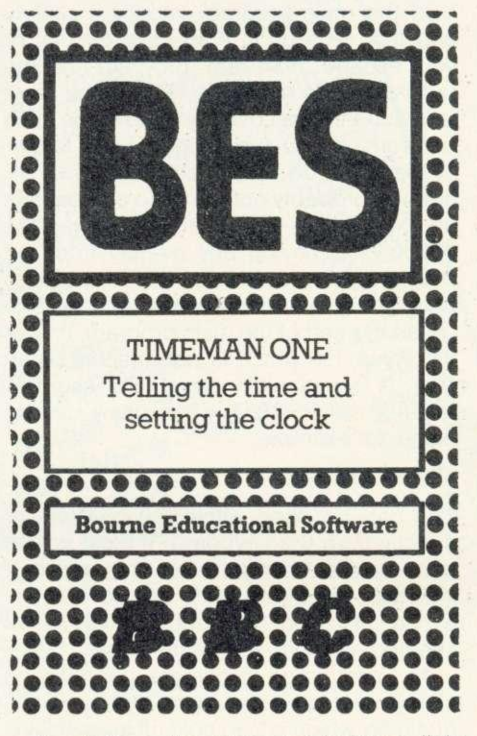
The program first covers telling hours only. The hour hand appears on the clock face and a ladder is set up on the side of the screen with a little man on it half way up. Enter the correct answer and he goes up, get it wrong and he goes down. There are some good features throughout the program. For example, if the wrong time is entered, you are told what has been entered and the computer goes back and asks you again. Six correct gets you to the top of the ladder, and the little man jumps up and down, fun and encouraging.

Error checking is taken care of and if after two goes you are still wrong, the answer comes up on the screen. The wording is a little strange, and is not the way eight-year-olds speak. The computer prints '4 o'clock is shown now', whereas a child would more easily read: 'This is 4 o'clock.' This raises a general issue with programs for whatever age. Language is very important, especially in printed instructions – and the screen is no different.

And so we go on, telling minutes – and hours and minutes, setting hours, minutes and hours and minutes. In these last two programs the exact position is difficult to estimate and an error within a certain range is counted as close and a re-try is given.

A very good feature is that once set up pupils can work at the program themselves. However, although hitting the escape key takes them back to the menu, break wipes out the whole program. Now, if all the other keys can be deactivated, why not break? Or else leave the program so we can type OLD and save three or so minutes loading time. A class of 30 primary children will soon learn that teacher has to come running whenever break is pressed.

One final feature is a recording system so each child who puts in his or her name has data about the work recorded, although there seems to be no provision for hard copy to be made by a printer.



Apart from the response being a little slow, and the need for help with minute intervals in the first stages, teachers in primary schools will be glad of the help this program can offer with a subject that does require a great deal of repeated practice.

Paul Garfield

FACE VALUE

Facemaker, Applied Systems Knowledge, 32k, £9.95

THIS program, designed for 5 to 12-year-olds by Gloria Galloway is a computerised Identikit. By asking the child questions, the computer builds up a face on the screen which may be edited at frequent points during the program.

The author claims there are about one million possible variations in design – and that is probably true. However, after a good deal of use, an underlying similarity about all the faces starts to creep in. This is due to several factors. The first is that in mode 5 only four colours are available at any time. The background is white (this is also the flesh colour – Caucasians only!), the lines for drawing are in black, leaving red and yellow for all other possibilities. Consequently, hair is either black or yellow; lips are always scarlet which, with some combinations of mouth-shape on a man can have a startling effect! Moreover, the hair-styles are confined to set patterns so a man with medium length hair is given a quite definite feminine style.

Having said all this, one must remember the memory limitations of the BBC micro and excellent use is made of what is available. Children who tested the program for me had to be prised away!

The instructions are clear and straightforward. The teacher's notes make some interesting suggestions and the presentation is most professional. Only one problem seemed to occur with any regularity which was that some of the phrases to be typed in were overlong.

Generally speaking – good value and well-written.

Nick Evans

FRUITFUL VENTURE

SpaceX, 4mat, £10 (£12 disc)

EDUCATIONAL software is to a large extent dependent on the skill of the teacher in finding extensions to the simple computer program. For this reason, the adventure game format can be well adapted for classroom use, particularly with younger children.

SpaceX from 4mat seems to have the right ingredients to inspire primary children in fields such as map-making, log-writing, art, creative and descriptive writing, and verbal and written communication. All this in addition to the fun of any well-constructed adventure game.

In this one you have to select equipment for a foray into the planet Persephone to collect articles essential to your return to earth. The location of these is given on a grid, and you have to choose your destination by the correct grid-reference.

This program could form the basis of at least one fruitful week in a primary school. The package is tattily presented, but the teacher's notes, though brief, are more than usually full of ideas.

The program loads in two sections from tape, and transfers directly to disc. Unfortunately, chaining the program involves stopping the tape after the first section is loaded, otherwise the block of the second program is missed. This can cause a frustrating waste of time and could have been avoided by leaving a greater gap between programs. The instructions are all available from within the program, but take a little getting used to, and there is no printed help on the action of the various keys.

George Hill

BYTE YEARS AHEAD!

Now available for the BBC Microcomputer, this superb range of high performance, low profile disc drives which give more data storage, and use less space.

The Pace range of drives include two drives which are switchable between 40 and 80 tracks. As these drives are double sided they give a massive 400 k *per drive* in 80 track mode, whilst in 40 track mode they retain compatibility with Acornsoft and other commercially available software. These dual track drives feature multi-colour LED's to indicate mode selection.

All Pace drives are capable of being used as double density drive so that, as and when, a new filing system and interface become available, the disc storage capacity will be doubled (eg. the dual 40/80 drive will have an unbelievable 1.6m of storage).

Pace disc drives are designed to run off the BBC power supply and are supplied complete with all cables, a utilities disc and manual.



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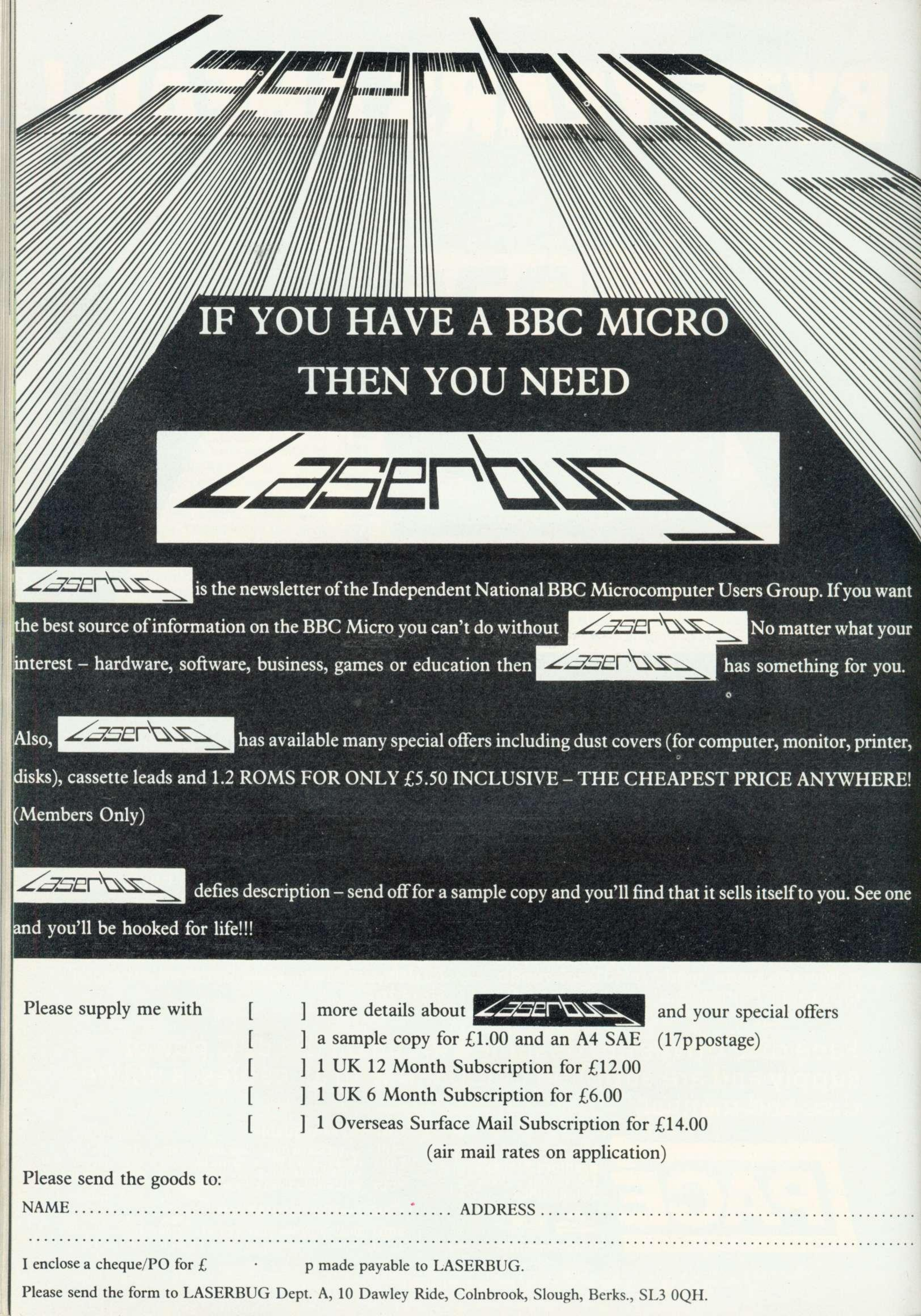
Dealer enquiries welcome

Disc drives available:-

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Climate, Five Ways Software, model B, £14.38

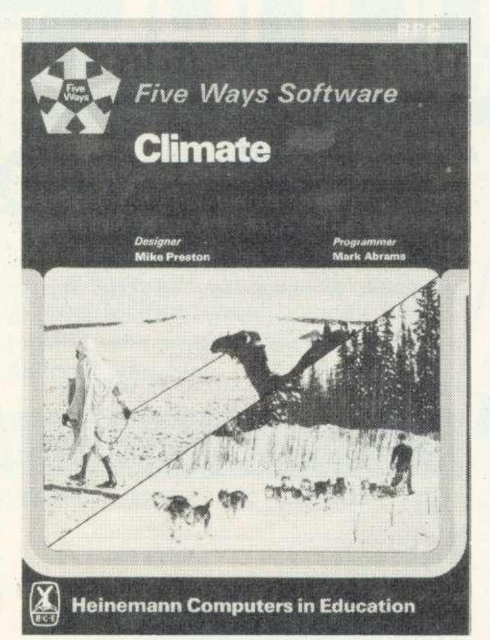
GOOD packaging and a very detailed booklet hide a rather arid subject. Aimed as it is for secondary school, not much use is made of colour, and there is no music. The manual covers loading from both disc and tape, there is a second copy on the back of the tape.

Because of copyright protection and the use of numerous data files, loading takes ages – especially bearing in mind that many schools have 35-minute periods and power glitches can cause havoc. I could name a few geography teachers who would go back to chalk and talk.

The teacher has to do some setting up, and changes can be made in the course of operation. The idea is to try to teach something about the climatic areas of the world, eg tropical, temperate, arctic etc. Data for rainfall and temperature for a whole year (averaged over 30 years or for just one) is displayed as a table, or graph. The same set of multiple choice questions are then asked. Wrong answers elicit help in the form of hints, usually a graph to show how words in the questions like light, heavy should be interpreted.

With 56 climatic variants, it sounds a good idea, but wasn't this program written for the RML 380Z machine? And didn't Chelsea do something similar with a mainframe nine years ago! Where is the colour? Where is the map of the world? It's easy to do. In fact, where is the 1983 approach? We can – and must – make more of our machines if we want to keep the enthusiasm of students, and convince teaching colleagues that there is a place for micros in the classroom.

Paul Garfield



Good packaging and detailed booklet hide out-dated style

PAC-MATHS

Number Gulper, ASK, 32k, £9.95

PROOF that mental arithmetic can be fun comes in *Number Gulper* from ASK. It turns addition, subtraction, multiplication and division into a highly attractive arcade-type game. It can be played at 15 levels, the lower levels are slow, involving only + and −, and are suitable for primary school, while only calculating prodigies will cope with level 15.

The program takes three minutes to load from tape in umpteen small bits, which I did not succeed in transferring to disc. Its chief drawback is the lack of instructions on which keys do what, and how to select the initial level. The instruction manual said the control keys were the same as for *Snapper* (and indeed the gulper makes the same noise), but I missed the bit that said 'hit the space bar to start', and had to reload the program, after breaking in frustration. A strange pointing finger in an unnoticed place at the left of the screen tells you to hit the space bar. I prefer words!

The idea is to turn one number into another by arithmetical operations involving numbers between 1 and 9 which you can 'gulp', together with their arithmetical operators. The start level depends on what number you input to 'make' initially – a fact not explained in the program or the literature. The time limit on the game is quite generous, and the clock stops with each new gulper, so you have time to plan your strategy.

This is an excellent arcade game, and excellent mental arithmetic training. It lacks the open-ended attaction of *SpaceX*, and its educational value would depend on your view of the importance of mental arithmetic – but a feel for numbers is never out of place.

George Hill

FLUID TASKS

Jars, Acornsoft Education, 32k, £11.90 (£15.35 disc)

DESIGNED for 7 to 13-year-olds, this package first of all introduces and then develops the concept of estimation. Working with the jars presented on the screen the child is able first of all to see different levels of liquid in the vessels and to read what fraction of the overall capacity is in them.

We then move on to the facility for emptying, filling and transferring liquid into the jars. At this point the child has to start to think about how to leave certain specific quantities in each jar – without being told how to do it! By pouring liquid from one jar to another, the child builds up the required amount in easy stages. A check is kept on how many operations were needed to complete the task. A new set of problems is then presented.

Adults watch with a superior gaze as the child struggles with what appears to be a simple task. Then the child says 'OK – you do it!' This part of the program may well leave you stumped for a while, so have a good practice first.

Jars is menu-based and easy to follow. The graphics are well designed with realistic filling and emptying of the jars. The authors have resisted the temptation to go overboard with sound effects and what few there are may be switched off.

The instructions are presented in large blocks which are heavy going, especially for younger children. The reinforcement pattern of learning is effective and the program seems to fulfil its task efficiently. A good value package for both the home and the classroom.

Nick Evans

NURSERY CRIMES

Sentence Sequencing, Acornsoft, 32k, £11.90 (disc £15.35)

SENTENCE Sequencing from Acornsoft seems to me a sheer waste of money. The child is invited to inspect a set of sentences (four to seven in the examples I tried, before boredom set in), and arrange them in their 'logical' order. The sentences relate to such things as traffic lights, and making a cup of tea. Up to 20 children (a silly number, when class sizes are in the mid-twenties plus), can use the program at once, having their results recorded. There is no mention of what the other 19 do while one is having his 200-second dose of computer assisted learning.

Nor is there any mention of what the program is intended to teach. It might increase reading speed, but I suspect any such result would be illusory, as the child would quickly learn to recognise the sentences, rather than read the words.

There is a second exciting (yawn) part to the program, in which the child is invited to get the lines of, would you believe, nursery rhymes in the correct order. Is this section aimed at the younger child? If so, why is it not first on the menu? Its pathetic nature is illustrated by the fact that the computer had the cheek to tell me I had got 'Hickory Dickory Dock' wrong. It then gave the correct answer – just what I had anyway!

George Hill

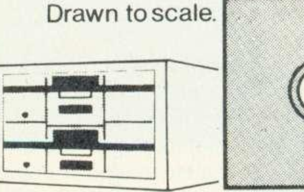
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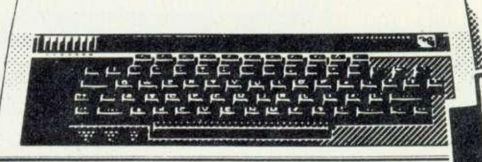
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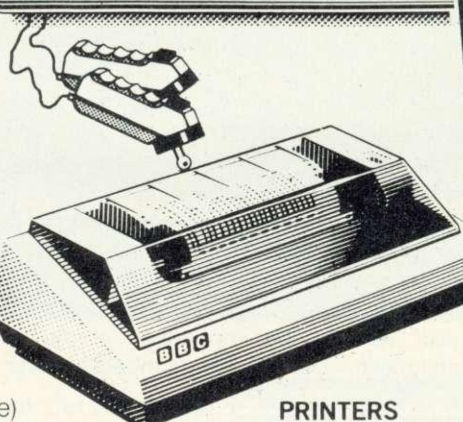
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Barry Pickles hosts this cash-for-tips column. Here's a chance to show off your talents—and earn some crinkly green stuff into the bargain. There are reckoned to be some 40,000 of you out there and, bearing in mind that the Atom has been around for more than two years, you must have accumulated a fair amount of expertise.

What we're looking for are those little routines, tips and hardware mods you've discovered. Don't worry if your little wrinkle seems too simple—it's probably just what someone else has been looking for. The same rules apply here as in Ian Birnbaum's Beeb Forum. Short, sweet and as original as possible is the name of the game. I'll start you off, but this is your page, so let's hear from you!

Send your ideas to Atom Forum, Acorn User, 53 Bedford Square, London WC1B 3DZ. If you want it returned, enclose a SAE. It should be typed or printed, with programs on cassette (with listing if possible).

MODE FOUR TEXT AND HEX

```
    5 REM Double-hei
ght characters
   10 ?#208=#CE; ?#2
09=#AC
   15 DIMA64; P=#AD0
0; CLEAR 4
   20 $A="THIS IS A
DOUBLE HEIGHT STRING
"
   25 ?#80=1; ?#81=0
; GOSUBw; END
 1000  w N=?#80*32+?
#81+#8000
 1005 FORM=0 TO LENA
-1
 1010 B=N; L=(M?A)-3
2; L=L*8
 1020 FORC=(L+P) TO
(L+P+7)
 1025 ?B=?C; B?32=?C
; B=B+64
 1030 NEXTC
 1035 N=N+1; IF N%32
=0 N=N+512
 1040 NEXTM; RETURN
```

Listing 1. Mode 4 characters

```
    5 REM Character
Print
   10 P=#3CA; PRINT$
21; [
   15 LDX@0; LDY@0
   20 LDA(#82),Y; ST
A(#80,X); INY
   25 LDA#80; CLC; A
DC@32; STA#80
   30 LDA#81; ADC@A;
 STA#81
   35 CPY@8; BNE P-2
0; RTS
   40 LDA#80; SEC; S
BC@#FF; STA#80
   45  LDA#81; SBC@1
; STA#81
   50 JMP P-17;  ];
PRINT$6
  100 REM Demo
  105 !#2800=#7C4444
38; !#2804=#3844447C
  110 !#80=#8020; !#
82=#2800
  115 CLEAR 4; LIST#
3CA; END
```

Listing 2. For printing odd characters

```
    5 REM Hex direct
   10 P=#21C; PRINT$
21; [
   15 JSR#FE71; CPY@
#FF;BEQ P-5; TYA
   20 ADC@32; STA#80
; JSR#FE52; JSR#FB8A
; RTS; ]; PRINT$6
   25 INPUT"CODING S
TART ADDRESS"P; I=P
   30 CLEAR0; PRINT$
30"location:"'; DO
   35 s H=0; PRINT&I
" ";FORC=0TO1; LIST#
21C
   40 Q=?#80; IFQ=CH
"X" END
   45 IFQ=46 I=I-1;
?#15=0; PRINT$7'; GO
TOs
   50 IFQ <48 ORQ>70
 OR(Q>57ANDQ<65); ?#
15=0; PRINT$7"INVALI
D CODE"'; GOTOs
   55 IFQ<58 Q=Q-48;
GOTOe
   60 Q=Q-55
   65 IFC=0 Q=Q*16
   70 e IFC=0 Q=Q*16
   75 H=H+Q; NEXT; P
RINT'; ?I=H; I=I+1
   80 UNTIL0
```

Listing 3. Quick entry of hex

IN JULY's Forum, I gave a routine to allow *Wordpack* users to produce mixed text and graphics. At the end, I casually mentioned that modes lower than 4 would produce progressively larger characters. What I omitted to add was that because of the way the screen is mapped, each line may not be more than 16 characters long and must be followed with a linefeed, otherwise (as some of you have found) the text overlaps.

My apologies and, by way of penance, listing 1 provides a means of printing double height characters in mode 4. It works by accessing the character set, which on *Wordpack* begins at #AD00, and doubling up each byte, thus printing on 16VDU lines, instead of the normal eight. The row and column at which printing is to begin should be stored, respectively, in #80 and #81 (see line 25). This is converted into an absolute address by line 1000 and line 1035 checks if the end of a print line has been reached. Line 10 is an alternative method of entering *Wordpack*.

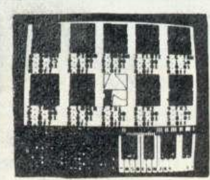
If you don't have *Wordpack*, but some other program to print in mode 4 (eg, *Soft VDU)*, you can also use this routine by altering the value of P to the base address of the character set which will be contained within your program—and you won't need line 10.

If you don't have any such program, but still want to print the odd character—or use one of your own definition—listing 2 will allow for this. #80,81 should contain the address where you want the character to be printed (LSB first) and #82,83 the address where your character is defined. I'm not going into the method of defining characters, since this has been well covered in various magazines. However, you should be aware that they are defined on an 8×8 matrix, ie, eight bytes per character. If you have the patience to define a complete ASCII set, you can also use listing 1 if you follow two rules. First, the initial character defined should begin on a page boundary, and second, characters should be defined in ASCII order, ie, codes 32-63 in the first page, 64-95 in the second and 96-127 in the third. Which brings me to listing 3. . .

In the good old days, home computers were programmed in machine-code and, since assemblers were relatively expensive (and memory was at a premium), assembly was done 'by hand'—in hex! Listing 3 provides a means of directly entering large amounts of hex into memory. It has many applications, not the least of which is quick entry of codes for user-defined characters.

Having supplied the start address (line 25), you are shown each location in turn and can enter hex numbers, without having to use the # symbol. If you make a mistake but don't discover it until later, pressing the copy key will step back one location for each press. Invalid codes are automatically rejected and pressing X will terminate the routine.

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KEY SEARCH IN ASSEMBLER

by W. Coker

I READ with interest Barry Pickles' INKEY routine in June's issue. Although the routine is fast, it can only read one key at a time, so for joystick input a different approach has to be taken.

AT&P shows the keys are on a matrix of 10 rows by six columns.

The rows are the output bits (0-3) of port A (#B000) and the columns are the input bits (0-5) of port B (#B001). So by naming the row and column it should be possible to check the state of any amount of keys in one routine. One more thing to notice is that the output bits (4-7) of port A are used by the graphics mode so any writing to location #B000 should always add the values of the mode:

Mode	0	1a	1	2a	2	3a	3	4a	4
Value(#)	00	10	30	50	70	90	B0	D0	F0

So to look at a key (say 'A') we find the row (6), add it to the mode number (for mode 4, #F0) and put it in location #B000 hence:

?#B000=?#B000&#F0+6

Then all you have to do is look at the column (bit 8) to check the key.

IF?#B001&8=0 P. "KEY A PRESSED"

The quickest way to read a number of keys is to choose keys in the same column and use a FOR. . . NEXT loop to change the contents of #B000.

The assembler routine in listing 1 looks at keys (B-F) in mode 4 and places either a 1 (no press) or 0 (press) in locations #80-#84. LINK LL0 to use the routine and read locations for 0's, (#80=F to #84=B).

```
 10 DIMLL(2),P(-1)
 20 P.S21;F.I=1 to 2
 30 [
 40 :LL0LDX@#F1;LDY@1
 50 :LL1STX#B000;LDA#B001; AND@8
 60 STA#7F,Y
 70 INX;INY;CPX@#F6;BNE LL1
 80 RTS
 90 ]
100 N.;P.S6
```

Listing 1. Multiple INKEY routine by W. Coker



AT RANDOM

by Jeff Carter

THE random number generator for the Atom appears to be located at #C986. After execution, locations 8, 9, 10, 11, and 12 are modified, and the new random number is in the four bytes starting at location 8 (!8), as well as on the Basic workspace stack. Because of this, it can't be used direct from Basic or any other language which uses these locations, such as Lisp or Forth.

However, it can be used by assembler programs which don't link with Basic. To generate a one-byte random number, use:

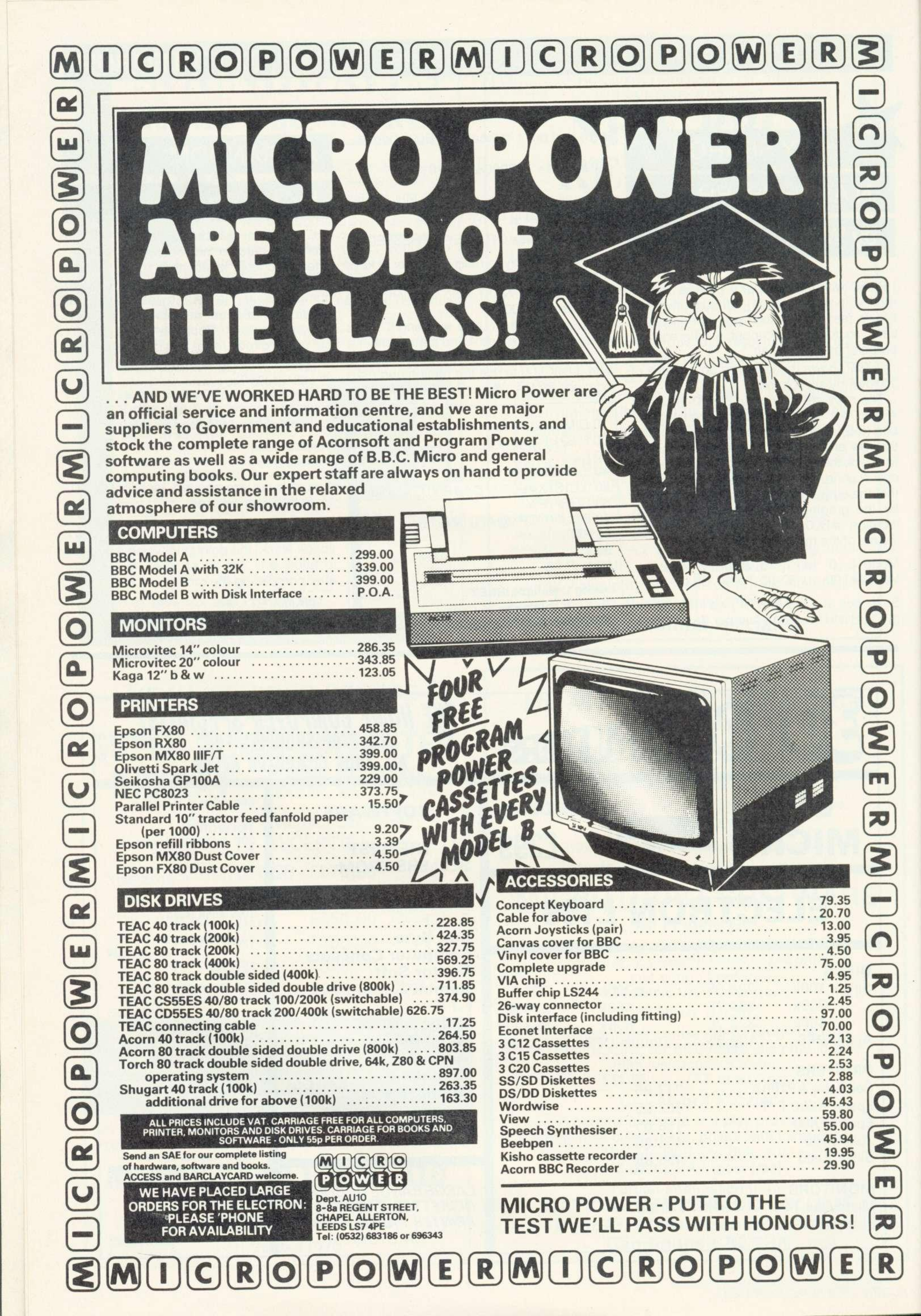
```
JSR#C986
LDA#8
```

If more bytes are needed, locations 9, 10, 11 and 12 can be used.

Note that this routine increments the workspace stack, the pointer to which is held in location #4. You *must* reset this pointer after completing the routine, so add:

```
LDA@0; STA #4
```

Jeff's tip gets him a crisp fiver.


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ALTERNATIVE TOOLBOX

HAVE you ever wished your Atom had a renumber command, or some really useful debugging aids such as a variable or memory dump available for use in programs or directly at the keyboard? One answer is to invest in a toolbox EPROM - the drawback is the loss of much hard-earned (?) cash. The alternative is to add your own utility commands written in assembler or Basic.

The trick in adding new commands to the Atom's vocabulary is to get the machine to recognise them. If an unrecognised command is entered, the Atom responds with the dreaded error 94. Page 194 of *Atom Theory and Practice* lists the various operating system vectors in block zero RAM. These vectors are each two bytes long and hold an address corresponding to a particular part of the Atom's interpreter. When a vector address is 'jumped too' the actual address passed into the 6502's program counter is the one contained in the vector - in other words don't jump to the vector but to the address held in the vector (figure 1).

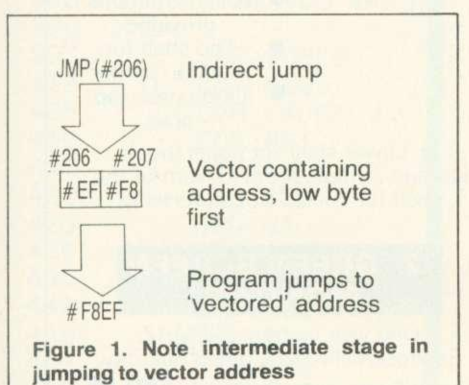


Figure 1. Note intermediate stage in jumping to vector address

```
START?#F000

F000 50 4C 4F 54 F5 4E 44 52
      .P .L .O .T    .N .D .R

F008 41 57 F5 42 4D 4F 56 45
      .A .W    .B .M .O .V .E

F010 F5 46 43 4C 45 41 52 F6
         .F .C .L .E .A .R

F018 7B 44 49 4D F0 AE 5B F2
         .D .I .M          .[

F020 A1 4F 4C 44 F5 31 57 41
         .O .L .D    .1 .W .A

F028 49 54 F1 4C C5 50 A4 5E
      .I .T    .L    .P    .^

F03B B1  5 C9 40 90 12 C9 5B
```

Figure 3. Output of Atom's graphics command table from program 3b

Located at hex address 206 is COMVEC, the COMmand line interpreter (CLI) VECtor. This normally contains F8EFhex, stored low byte first. Whenever the Basic interpreter encounters a cassette operating system (COS) command, ie one prefixed by an asterisk, this address is jumped via the vector. By resetting COMVEC to point to our own CLI it is possible to make the Atom recognise and execute new commands.

The new CLI and utilities will have to be stored somewhere and I have chosen the screen memory normally reserved for mode 4, from 8300 hex onwards. By altering the various RAM addresses in the following programs, it can be kept elsewhere.

For instance, if you expanded your Atom by 2k as described in the January 83 issue of *Acorn User* they could sit out of the way from 9800 hex onwards, thereby freeing the screen memory for high-resolution graphics.

Program 1 gives the assembler listing which, when run, generates the machine

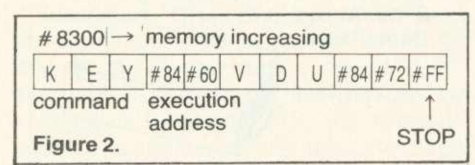


Figure 2.

Variable	LSB			MSB
@	321	33C	357	372
A	322	33D	358	373
B	323	33E	359	374
C	324	33F	35A	375
D	325	340	35B	376
E	326	341	35C	377
F	327	342	35D	378
G	328	343	35E	379
H	329	344	35F	37A
I	32A	345	360	37B
J	32B	346	361	37C
K	32C	347	362	37D
L	32D	348	363	37E
M	32E	349	364	37F
N	32F	34A	365	380
O	330	34B	366	381
P	331	34C	367	382
Q	332	34D	368	383
R	333	34E	369	384
S	334	34F	36A	385
T	335	350	36B	386
U	336	351	36C	387
V	337	352	36D	388
W	338	353	36E	389
X	339	354	36F	38A
Y	33A	355	370	38B
Z	33B	356	371	38C

all addresses are in hexidecimal

Figure 4. Variables don't occupy successive bytes

```
  5 PRINT $21
 10 DIM LL10
 15 FOR N=2 TO 10 ;
    LLN=-1 ; NEXT
 20 LL1=0
 25 FOR N=1 TO 2
 30 P=&8400
 35 [\ RESET CLI VECTOR
 40 :LL0 LDA @LL1%256
 45      STA #206
 50      LDA @LL1/256
 55      STA #207
 60      RTS
 65 \ COMMAND LINE
    INTERPRETER
 70 :LL1 LDX @255
 75      CLD
 80 :LL5 LDY @0
 85      STY #DD
 90      JSR #F876
 95      DEY
100 :LL3 INY
105      INX
110 :LL6 LDA #8300,X
115      BMI LL2
120      CMP #100,Y
125      BEQ LL3
130      DEX
135 :LL4 INX
140      LDA #8300,X
145      BPL LL4
150      INX
155      LDA #100,X
160      CMP @CH"."
165      BNE LL5
170      INY
175      DEX
180      BCS LL6
185 :LL2 STA #CA
190      CMP @255
195      BNE LL7
200      JMP #F8EF
205 :LL7 LDA #8301,X
210      STA #C9
215      STY #3
220      LDY @0
225 :LL8 LDX @0
228 \ RESET INPUT BUFFER
230 :LL9 LDA (#5),Y
235      INY
240      CMP #100,Y
245       BNE LL8
250      INX
255      CPX #3
260      BNE LL9
265      STY #3
270      CLC
275      LDX @0
280      JMP (#C9)
285      BRK
290 ]
295 NEXT N
300 PRINT $6
305 END
```

Program 1.

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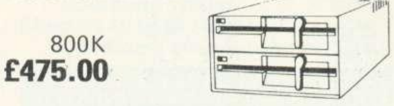
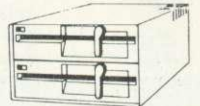
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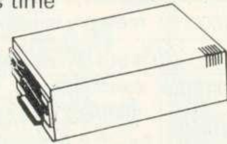
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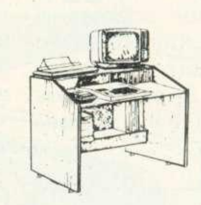
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code necessary for the new CLI. The code is assembled in just 90 bytes from 8400 hex. Program 2 details the Basic and assembler text needed to create two new commands called *KEY and *VDU which provide the true keyboard scanning command absent on the Atom, and cursor repositioning anywhere on the screen. Each is assembled above the CLI from 8460 hex and together occupy only 49 bytes!

Before discussing program 1, look at lines 490 to 520 of program 2. These construct the command table (CT) which the CLI uses to see if the command it is interpreting is in its new extended vocabulary. Figure 2 illustrates the construction of the CT in memory from 8300 hex. Each command's name is stored in ASCII format minus the asterisk, and is followed by its hexadecimal execution address, high byte first. As can be seen from figure 2, the execution addresses for *KEY and *VDU are 8460 hex and 8473 hex respectively. The top of the CT, which I have termed 'STOP' to distinguish it from Basic's TOP, is marked by a negative byte, FF in this case. This *must* be repositioned when new commands are added to the CT.

Both listings can be entered as one and when run the machine code they generate can be preserved with:

* SAVE "TOOLKIT" 8300 8492 8400

The new CLI is initialised by entering 'LINK #8400'. The code begins by executing the assembler of lines 40-60 which reset COMVEC to point at the new CLI which begins at line 70. If the Atom now encounters a COS command it will jump first of all to this address and hence the new CLI. The CLI begins by initialising the processor status register and then clears location DD, of which bit 7 is used to indicate whether a *FLOAD command is in operation (bit 7=1). The subroutine located at F876 (line 90) searches through the input buffer, located from 100 hex, for the first non-blank character. The first character in the CT is then loaded into the accumulator (line 110) and compared against the first in the input buffer (line 120).

Successive bytes are compared in a similar manner against each other, for as long as the comparisons succeed. If the execution address is reached (depicted by a negative byte, line 115) the two-byte address is tranferred into the zero page locations, C9 and CA (line 185 to 210). If STOP is reached (line 190), the search through the new CT has been unsuccessful so control is handed back to the Atom's own CLI (line 200), otherwise the contents of the input buffer are reset (lines 230 to 275) and an indirect jump via zero page is made to the execution address of the machine code constituting the identified command (line 280).

If the comparison sequence fails, the next command in the CT is located (line 135 to 145) and the process recommences. A command abbreviated by a full stop (eg *. for *CAT) results in the new CLI passing control immediately to the Atom's own CLI as new commands may not be shortened in the normal manner (line 160).

Both of the new commands can be used from within programs or at the keyboard. In its present form, *KEY stops and waits around for an alphanumeric key to be pressed returning its ASCII value in the Basic variable 'A'. It differs from the INPUT statement in that the '?' prompt is not issued and the depressed key is not echoed to the screen. The routine uses the Basic interpreter's keyboard scan subroutine located at FE94. Alternatively, the command could be modified to perform a

```
305 DIM XX0
310 PRINT $21
315 FOR N=1 TO 2
320 P=#8460
325 [       \ ** KEY **
330 :LL9  LDA @0
335       STA #33D
340       STA #358
345       STA #373
350       JSR #FE94
355       STA #322
360       RTS
365 ]
370 NEXT
375 FOR N=1 TO 2
380 P=#8472
385 [       \ ** VDU **
390 :XX0
395       JSR #C3C8
400       LDY #E0
405       LDA (#DE),Y
410       EOR #E1
415       STA (#DE),Y
420       LDA #53
425       AND @1
430       ORA @128
435       STA #DF
440       LDA #52
445       AND @31
450       STA #E0
455       LDA #52
460       AND @244
465       STA #DE
470       RTS
475 ]
480 NEXT
485 PRINT $6
490 $#8300="KEY"
495 ?#8303=LL9/256
500 ?#8304=LL9%256
505 $#8305="VDU"
510 ?#8308=XX0/256
515 ?#8309=XX0%256
520 ?#830A=255
525 LINK #8400
530 END
```

Program 2. Creates two new commands

```
305 P=#8450
310 [
315 :LL9 LDA @#86
320      STA 18
325      JMP #CE86
330 ]
335 PRINT $6
340 $#8300="DUMP"
345 ?#8304=LL9/256
350 ?#8305=LL9%256
355 ?#8306=255
```

Program 3a. Implementing new commands in Basic

```
100REM ** DUMP **
110PRINT $12
120@=2
130INPUT "START"A
140DO
150 PRINT &A" "
160 FOR N=0 TO 7
170  PRINT &A?N" "
180 NEXT N
190 PRINT'"     "
200 FOR N=0 TO 7
210  B=A?N
220  IF B<#1F GOTO a
230  IF B>127 GOTO a
240  PRINT"."$B" "
250bNEXT N
260 LINK #FFE3
270 A=A+8
280 PRINT''
290UNTIL 0
300END
310aPRINT"  "
320GOTO b
```

Program 3b. ASCII and hex memory dump code

```
100REM ** ZERO **
110DIM ZZ1
120P=#2800
130[
140       LDA @0
150       TXA
160:ZZ0   STA #322,X
170       STA #33D,X
180       STA #358,X
190       STA #373,X
200       INX
210       CPX @26
220       BNE ZZ0
230       RTS
240]
250END
```

Program 4. Clears integer variables

single keyboard scan by altering these lines:

```
10 DIM LL12
350 JSR #FE71
351 BCC LL12
352 PHP
353 JSR #FEB1 convert to ASCII
355 LL12 STA #322
```

*VDU allows the Atom's cursor and prompt to be repositioned anywhere on the screen. The command should be followed by a number, variable or expression giving a value in the range 0 to 512. These two values correspond to the top left and bottom right corners of the screen.

Four bytes of zero page RAM are associated with the Atom's cursor. DE and DF hold the address of the start of the line containing the cursor, ie 8000 hex, 8200 hex etc, while E0 contains a value in the range 0 to 31 giving the location of the cursor on that line. The value in E1 determines whether the cursor is 'on' or 'off'. Pokeing this location with 0 will switch if off, while 80 hex will switch it on.

The subroutine at C3C8 (line 395) converts the value following the *VDU command into binary and stores it in the two bytes at 52 and 53. The current cursor position is obtained (lines 400, 405) and the cursor is switched off (lines 410, 415). The binary value previously converted is then transformed into a screen address (lines 420 to 465) and the cursor repositioned (line 470).

The following short program demonstrates the use of the two new commands:

```
10 PRINT    $12    "REPOSITIONING CURSOR"
20 *KEY ; REM VALUE RETURNED IN A
30 *VDU A
40 END
```

If you are not fluent in assembler, you'll be pleased to learn that it is possible to implement commands written in Basic, though seven bytes of machine code are still required to instigate the interpretation of the Basic utility. The assembler mnemonics for this approach are given in program 3a which may be entered in place of program 2. If you intend to use only Basic based commands, lines 228 to 268 of listing 1 are redundant and can be omitted.

This example shows how an ASCII and hex dump of memory may be produced with the command *DUMP. The code for this is given in program 3b and an example of its output is shown in figure 3 illustrating the Atom's own graphics command table. Any basic-based utility *must* begin directly on a memory page boundary (ie, #86,

```
100REM ** DECIVAR **
110DIM LL5
120FOR N=1 TO 2
130P=#2800
140[      LDA @14
150       JSR #FFF4
160       LDY @0
170:LL3   STY #AF
180       LDX @1
190       JSR #C8E3
200:LL1   JSR #FFED
210       LDA #AF
220       ORA @64
230       JSR #FFF4
240       LDX @0
250       JSR #C589
260:LL2   LDY #AF
270       INY
280       CPY @27
290       BNE LL3
300       JSR #FFED
310       LDA @15
320       JSR #FFF4
330       RTS
340]
350NEXT
360END
```

Program 5. Decimal dump of Basic's integer variables



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#87 . . .). In this instance *DUMP should be located from 8600 hex so before typing it in, reset the page pointer with:

?18=#86
NEW

When the CLI identifies the *DUMP command it passes control to the seven bytes beginning at 8450 hex. This code simply resets the page pointer to 86 hex (lines 315, 320) and then jumps directly into the Basic interpreter to begin execution of the program in the current text space! When using this method of running Basic programs it is not possible to use the DIM statement; an error will result if you do. This does not hinder program development too much as strings and arrays can be dimensioned in the good old fashioned way—by hand. For example, the statement DIM A(9),B(9) reserves 20 bytes of memory above the program's TOP. This could be constructed manually as, A=#2800 ; B=A+10. Here the base of the array table is at 2800 hex.

Further Basic commands may be added simply by duplicating lines 315 to 325 of program 3a, but adjusting the page boundary defined in line 315 as required, and of course extending the CT and resetting STOP.

One final point, an important one, whenever a break is executed the COMVEC vector will be reset by the interpreter's initialisation routine. It is therefore necessary to re-link the toolkit with LINK #8400 before the new commands can be re-used.

So far in this article, we have seen how toolbox-type commands can be added to the Atom's Basic vocabulary using either machine code or Basic routines stored in RAM. Now, several utilities are presented which can be added to the cassette-based toolbox, or used just as they are simply by linking to their start address.

All the utilities given here are written in assembler which puts the machine code it generates into the floating point variable space from 2800 hex onwards. Altering the value of P, the program counter, allows the hex to be assembled at any other desirable location.

If you intend to add these utilities to your toolbox it is important to remember the following points:

- assemble the utilities above commands already present;
- add each command's name and execution address to the command table;
- reset the position of STOP.

One of the easiest ways of sorting out a bug-ridden program is to obtain the values of the variables it uses as it runs. Ideally, all variables should be set to a known value such as zero so any change can be readily seen.

Each of the Atom's 27 integer variables are allocated four bytes of memory in block zero RAM from 321 hex to 38C hex inclusive, however, as figure 4 shows, variables do not occupy successive bytes. ZERO (program 4) will clear each integer variable (with the exception of @ which is normally left set to 8 for printing purposes), to overcome the problem of uninitialised variables which on the Atom would otherwise contain unpredictable values. It also avoids the need for including opening program lines such as:

10 A=0 ; B=0 ; C=0 ; D=0 ; E=0 ; F=0; G=0

and so on. Now with this utility simply execute LINK#2800 (or the address where the code is located), or *ZERO if you add it to your toolbox!

Variable values can be printed out by the Atom in two forms, decimal and hexadecimal. DECIVAR (program 5) produces a decimal dump of each of Basic's integer variables. The listing produced is continuous down the screen, so to avoid screen scrolling the Atom is switched to paged mode. Hitting a key will complete the listing before it returns to normal teletype mode. Lines 190, 200 and 250 contain three addresses not described by Acorn. These are:

#C8E3 : place variable value in zero page locations #16, #25, #34, #43.
#C589 : convert binary value in above to decimal and print it.
#FFED : output carriage return and linefeed.

AFhex at the top of the 'free' zero page RAM is used as a counter. Before jumping to the subroutine at C8E3 (line 190) the Y register is loaded with the current variable number, eg, @=0, A=1, B=2 . . . etc as the routine uses absolute indexed addressing to obtain each byte of the variable. The X register is initialised to 1 (line 180) for similar reasons. After loading the accumulator with the 'variable number' (line 210) it is logically ORed with 64 (line 220) to 'force' bit 6 to a 1 thereby converting the variable 'number' into its ASCII code ready for printing by line 230. After the decimal value of the variable is printed (line 250) the various counters are incremented, a carriage return and linefeed performed (line 300), and the process recommenced until complete (lines 280, 290).

HEXVAR (program 6) outputs the hexadecimal values of the variables in a similar manner to DECIVAR. The format produced is not unlike that produced by the word indirection operator, eg PRINT &!A. Indexed addressing is used to obtain each of the four bytes of a variable which are

```
100REM ** HEXVAR **
110DIM LL2
120FOR N=1 TO 2
130P=#2800
140[:LL0 LDA @14
150      JSR #FFF4
160      LDA @65
170      STA #A0
180      LDX @0
190:LL1  JSR #FFF4
200      LDA @CH"="
210      JSR #FFF4
220      LDA @CH"#"
230      JSR #FFF4
240      LDA #322,X
250      JSR #F802
260      LDA #33D,X
270      JSR #F802
280      LDA #358,X
290      JSR #F802
300      LDA #373,X
310      JSR #F802
320      JSR #FFED
330      INC #A0
340      LDA #A0
350      INX
360      CPX @26
370      BNE LL1
380      LDA @15
390      JSR #FFF4
400      RTS
410]
420NEXT
430END
```

Program 6.

```
100DIM XX5
110FOR N=1 TO 2
120P=#2800
130[ \ ** RENUMBER **
140:XX0 LDY @0
150     STY #A3
160     STY #A2
170     STY #A0
180     LDA #12
190     STA #A1
200:XX1 LDY @1
210     CLC
220     LDA @5
230     ADC #A2
240     STA #A2
250     BCC XX2
260     INC #A3
270:XX2 LDA (#A0),Y
280     BMI XX5
290     LDA #A3
300     STA (#A0),Y
310     LDA #A2
320     INY
330     STA #(A0),Y
340:XX3 INY
350     BNE XX4
360     INC #A1
370:XX4 LDA (#A0),Y
380     CMP @13
390     BNE XX3
400     CLC
410     TYA
420     ADC #A0
430     STA #A0
440     BCC XX1
450     INC #A1
460     JMP XX1
470:XX5 RTS
480]
490NEXT
500END
```

Program 7. Renumbers in steps of five



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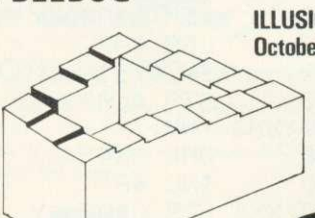
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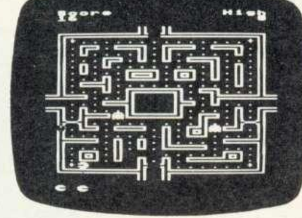
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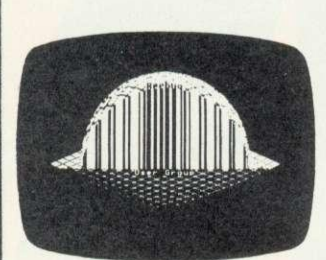
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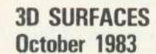
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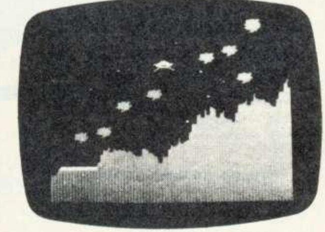


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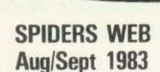


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July issue: Games: Robot Attack (32k) and Anagrams, a 16k word game. Watching the Beeb at work—a sample program to show your micro at work. An introduction to discs—what are they and are they worth getting. Balloons—a coloured animation. Make your micro speak like Kenneth Kendal. Bad Program Lister—lists programs even when the computer pronounces them 'bad'. Reviews of Epson and Seikosha's new printers. Five books of programs reviewed, plus more software reviews. Using Files Part 4. A full disc sector editor program—to read and retrieve lost disc files, and how to modify Acornsoft's Planetoid. Plus hosts of useful hints.

Aug/Sep Issue: Games: Space Lords (32k) a two-player space battle, and Mars Lander (16k). Build yourself a light pen—a simple explanation for the beginner, together with a sample program. Use our "Contact Points for the Beeb" to discover who to contact when in need. We show how to put those 'awkward' cassette programs onto disc. Final instalment of our popular 5-part series on "Using Files" REVIEWS of—MICRONET, Watfords Electronic's Disc Filing System, two EPROM programmers, and the tax advisory package "Microtax". This month's visual programs include Spider's Web, Super Large Screen Characters, Bounce and Swing. We also show how to hold two complete screen pictures at once, and switch rapidly between them in "Dual Screens on the Beeb". A Crossword, Brain Teaser and our 4th Software Competition provide a competitive edge to this month's magazine. We also have our very popular scattering of Hints and Tips.

October Issue: Games: **Munch-man,** a Snapper type game with super graphics, **Illusions** graphics and sound you won't believe. A versatile **Renumber** program for Basic, **Fabric Patterns,** an invisible **Alarm Clock, Disc Sector String Search** and a program for drawing **3D Surfaces.** Articles on the **Teletext Mode** for beginners, **Compilers and Interpreters,** using **Joysticks,** using the **Speech Synthesizer** and more. Reviews of two **Cassette Recorders** (Marantz Superscope C190 and Acorn Data Recorder), three **Printers** (NEC pc-8023B, STAR DP840 and CP-80), amnd lots of new games software (and we've arranged **SPECIAL OFFERS** for members). Plus a review of the new **Acorn Electron** and news of our new magazine for Electron users called **ORBIT.** Plus all our usual features like Hints and Tips, Postbag, and a new Brainteaser.

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printed as hex values by the subroutine located at F802hex. In this instance A0hex is used as a zero page counter.

A renumbering routine is particularly useful, and program 7 gives a simple version that works in the current text space in steps of 5. This increment value may be altered by adjusting line 220. The utility uses four bytes of the zero page user area as a scratchpad as follows:

#A0 and #A1: current position in program being renumbered.
#A2 and #A3: current 'new' line number.

The program works by searching through the current text space until it encounters a carriage return, ie ASCII 13 (lines 330 to 380). The two bytes following this will contain the 'old' line number stored in binary form, with the high byte first. This is replaced by the 'new' line number contained in A2hex and A3hex (lines 290 to 330). These two bytes are then incremented by five (or otherwise) to prepare the next new line number (lines 210 to 260) after which the next carriage return is sought out. If FFhex is found immediately following a carriage return (line 280), the end of the program has been reached and renumbering completed.

The final utility is ALARM (program 8). This sounds a series of bleeps, indicating the completion of a LOAD or a SAVE, until a key is pressed. This frees you from having to wait around staring at the screen for the Atom prompt '>' to reappear (a watched kettle . . .). When executed, the COS load and save file vectors, LODVEC and SAVVEC, are repointed to XX1 and XX0.

A LOAD or SAVE will now be executed via the utility at lines 260 and 290 respectively. Upon completion, control is returned to the utility which outputs the bleeps until a key is pressed (lines 300 to 330). A further two interpreter-based subroutines are employed; #FD1A is simply a machine based PRINT $7, while #FE71 performs a single scan of the keyboard. It clears the carry flag on detection of a key, and that key's ASCII code is then placed in the Y register. ●

```
100REM ** ALARM **
110DIM XX2
120XX0=0 ; XX1=0
130FOR N=1 TO 2
140P=#2800
150[      \ RESET VECTORS
160       LDA @XX0%256
170       STA #20E
180       LDA @XX0/256
190       STA #20F
200       LDA @XX1%256
210       STA #20C
220       LDA @XX1/256
230       STA #20D
240       RTS
250:XX0 \ SAVE FILE
260       JSR #FAE5
270       JMP XX2
280:XX1 \ LOAD FILE
290       JSR #F96E
300:XX2 JSR #FD1A
310       JSR #FE71
320       BCS XX2
330       RTS
340]
350NEXT
360END
```

Program 8. Routine and alarm

FOR THE ACORN ORBIT ELECTRON

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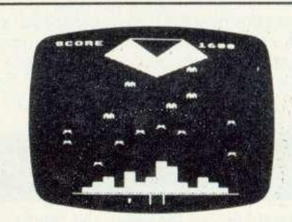
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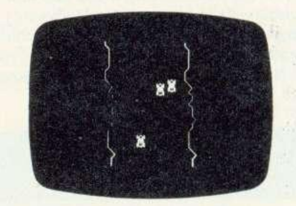
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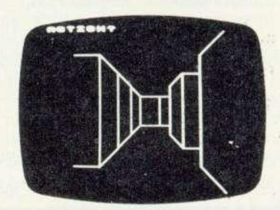
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ALEX THE MADMAN

A Seikosha printer awaits—but first you must solve Simon Dally's ridiculous riddles

LAST month saw you at the second level of the dungeon beneath the offices of *Acorn User* in Bedford Square, seeking the second Microage printer. You will recall that in the dungeon there are two basic types of character: dwarfs (who always tell the truth) and trolls (who always lie).

Those who persevered were able to locate the second printer within the closely-guarded personal fridge of the managing-director of Addison-Wesley. Now, behind the printer, is a numeric keypad and a sign telling you to feed in the smallest palindrome which has an even number of digits and is also a perfect square (ie the result of squaring a positive integer).

As your trembling fingers punch out the correct digits, the whole floor gives way and you find yourself slithering down a chute. With a bump, you come to rest on a pile of dusty competition entries in a dark dank cellar.

As your eyes adjust you begin to make out various rooms leading off your cellar which seem to contain curious-looking safes bearing strange inscriptions. Also, in the corner is a strange machine making thumping noises.

Suddenly there is a sound of muted cackling and a vile-looking character slimes into view. You reach for your sword but, to your horror, you realise you have left it behind. 'Welcome, welcome, my fine friend', rasps the little fellow. 'I am Mad Alex, custodian of this forsaken place.'

Alex rabbits on seemingly for days about bugs, and then, with a glint in his earring, reveals the following tale:

'Many aeons ago, there were two brothers, Dwarf and Troll. They were both Master Metalsmiths; but while Dwarf was honest and truthful, Troll was dishonest and a liar. Both founded mighty lineages and their offspring, who took on their characteristics, inhabit the levels of the dungeon through which you have passed.

'Amongst these rooms are scattered various safes to which I can conduct you. But beware you follow these rules.

'First, all safes contain gold pieces but only one safe in each room contains dwarf gold. All other gold is worthless troll gold.

'Second, each safe, including its inscription, is the work of one individual unaided.

'Third, the gold pieces in each safe may not have been placed there by the character who made the safe. However, unless you can prove from the inscriptions alone where the dwarf gold is, it is always in a safe fashioned by a dwarf.

'Finally, gold pieces proven to be from a room in which the Master Dwarf worked are worth five times the amount of other pieces of dwarf gold.

'The descendants of the Master Dwarf and the Master Troll also worked here, but after a few hundred years they grew bored and left to inhabit the upper levels of the dungeon, to write for *Acorn User* and work in computer shops.

'Now only I remain to tell the tale. As I conduct you through the rooms you must collect only dwarf gold: if at the end of your sojourn here you can give me the correct number of gold pieces, the Seikosha printer shall be yours.

'If you fail, as have all your predecessors, you shall be pulped in that machine to provide paper for the next issue of *Acorn User*.'

Taking your computer and truth tables you follow Mad Alex into a room labelled 'Hermann's Hide-out', where you see three safes.

'In this room,' he declares, 'only one dwarf worked. The combination of the safes is the lowest positive integer you can find which is a fifth power when divided by 5, a perfect cube when divided by 3 and a perfect square when divided by 2. Find this number, then remove the last six zeros.'

Of course you got the correct combination and opened the safes. In the first safe are 11 gold pieces, in the second 13 and in the third 17.

The inscriptions read as follows:

- The dwarf gold is in here.
- The dwarf gold is not in here.
- The dwarf gold is not in the first safe.

Gathering up your genuine dwarf gold pieces, you follow Alex into the second room, 'Cristopher's Corner', where he wheezes: 'At least one dwarf and one troll worked in this room. Let me remind you, however, that only one safe contains the true dwarf gold. To discover the combination to the safes you must solve the following riddle: In what number base can the decimal number 316,555,201 be represented by the number 54,321? The combination is the square of this number base.'

The inscriptions on the safes read:

- The dwarf gold is not in the second safe.
- The dwarf gold is not in here.
- The dwarf gold is in here.

The first safe contains 22 gold pieces, the second safe 25 and the third 29.

In 'Laurie's Lair' you find two safes. Mad Alex describes how the safes here date from the era when only the Master Dwarf and the Master Troll were at work making safes and gold pieces. The correct combination can be found by computing the ages of the Master Dwarf's two sons, Elk and Tron, at the time the combinations were set. It was discovered that if you added the cubes of both their ages together and divided by two, the result was precisely the square of the Master Dwarf's own age, and this square was the combination number of the safes.

It should be added that neither of the dwarflets' ages shared a common factor (other than 1) and neither was a factor in the Master Dwarf's age.

The inscriptions read:

- The dwarf gold is not in here.
- Exactly one of these two safes was fashioned by the Master Dwarf.

The first safe contains 41 gold pieces, the second safe 57.

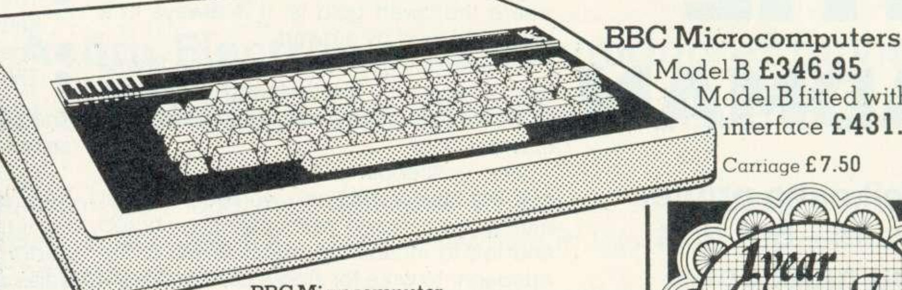
The fourth room, 'Andy's Attic', reveals two more safes and here Mad Alex affects a tone of reverence as he declares that in his opinion it is the greatest collection of art he has ever guarded. The combination to open the safes is obtained by finding two five-digit integers, together containing all the digits from 0 to 9, whose squares each contain all the digits from 0 to 9 once and once only. The combination is arrived at by adding the two five-digit integers together.

The inscriptions read:

- Both these safes were made by trolls.
- Neither of these safes was made by any



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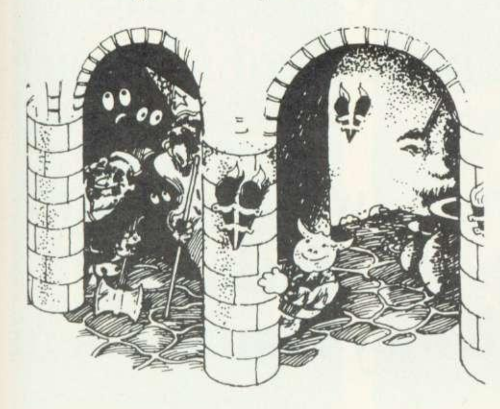
offspring of the Master Dwarf nor any offspring of the Master Troll.

The safes are found to contain 75 and 85 gold pieces respectively.

In 'David's Dug-out' there are two safes inscribed as follows:

- If this safe was made by a dwarf then the Master Troll made the other one.
- The other safe was made by the offspring of the Master Dwarf.

Alex explains that the correct combination here is obtained by adding all the combinations together that you have so far used (that is, one safe from each room and the combination in the MD's fridge). When you've done this you find 123 gold pieces in the first safe and 157 in the second.



Now you are in a position to give Mad Alex the correct number of gold pieces and claim the printer.

What is the correct number of pieces of dwarf gold to give the brute (remembering to multiply all Master Dwarf gold pieces by 5)? Also, what is the sum of all the combinations you had to use to get into the last safe? (You should end up with an eight-digit number containing one zero and only one even digit.) If the number of gold pieces isn't over 1000 (with no digit in the figure repeated) then you're on the wrong track, though if you're convinced you ain't, best to send us a complete set of answers.

Answers on a postcard please to November Competition, *Acorn User*, 53 Bedford Square, London WC1B 3DZ to arrive not later than December 5, 1983.

As consolation prizes, two people who get the correct answer but don't win the printer may get £20-worth of Acornsoft software for the BBC micro by pointing out in fewer than 30 words a glaring anomaly in this (somewhat unlikely) little tale!

WINNERS FROM AUGUST ISSUE

THE answer to the Playfair cipher in our August issue was: 'It is the firm conviction of the author of this article that the Hitler diaries were forged by a bankrupt Acorn User reader seeking to raise the cash to buy himself the disk drive and printer for his microcomputer.'

The alphabet had been encoded using the phrase 'For whom the bell tolls'.

There were a mere 20 correct entries, indicating either that most of you found it too difficult or you were all on holiday (without a micro). There was no correct entry to the under-13 problem so we might set it again at a later date.

The winners were E. W. Swarbrick of Manchester and Miss J. M. Painter of Bristol University, to whom Acornsoft packages worth £20 have been sent.

The new boy from Acorn already has a gang of playmates.

The Acorn Electron, Britain's most exciting new home micro, already has a range of software programs specially designed for it by Acornsoft, makers of software for the BBC Micro.

There are six mind-boggling games, two programming languages, two exciting graphics cassettes, a home educational program and a personal money management program.

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ACORNSOFT

BATTLE OF THE BEEBCALCS

There are now two spreadsheet programs called 'Beebcalc'. Jacquetta Megarry puts them side-by-side

WHETHER or not Gemini are right to say they publicised the name of *their* Beebcalc first, readers may be confused by the existence of two spreadsheets for the BBC micro with the same name. They are in fact very different. Comparisons are inevitable, so readers new to spreadsheets or unaware of the Computer Concepts Beebcalc may find it helpful to refer to the article in October's issue by Joe Telford (pages 30-35).

Gemini's Beebcalc costs £19.95 (£23.95 on disc), as against Computer Concepts' ROM costing £40. The comparison of price and media is complicated by the option of linking graphics directly to the packages. Related programs by both companies allow you to load spreadsheet data files direct (no retyping of entries) and to display selected rows or columns as a histogram, graph or pie chart.

Gemini's Beebplot costs £19.95 (£23.95 on disc), and includes built-in screen dump routines. These work for Epson printers, and produce hard-copy of the kind illustrated in figures 1 to 3 without even having to open the dreaded Epson manual. This may provide many people with their first occasion to use screen dumps. As long as you know about the peculiarities mentioned below, it is likely to be an easy and rewarding experience.

Computer Concepts supplies a free utility called Beebgraph with their spreadsheet ROM which might seem parallel to Beebplot. In a sense it is churlish to criticise anything which is free, and unfair to compare it with a free-standing program like Beebplot. However, the *total* price of both Gemini programs on cassette is the same as Computer Concepts' Beebcalc alone, and the disc version (on which this review is based) only £8 more.

It must be said that Beebplot is streets ahead of Beebgraph. It is fast (written in machine code), uses colour effectively (in the screen display) and produces well-labelled print-outs (after redrawing in a form suitable for dumping). It is easy to use and has thoughtful features, like a code which generates months automatically. You can vary the size of the histogram, then dump it on paper. The grid lines shown in figure 1 are optional; the data was loaded automatically from the 'purchases' row of figure 4.

The graph section of Beebplot allows alternative treatment of the same information. Figure 2 shows a point plot of the same row from figure 4. The months are chosen and scale markings appear automatically, but this time the overall size is fixed. (Incidentally, the formula section allows you to plot functions defined by any valid Basic expression, even superimpose two graphs. This has nothing to do with spreadsheets, but teaching algebra should never be the same again!)

Overall, using Beebplot makes Beebgraph's monochrome displays with minimal labelling and no true scaling look primitive. To dump them on paper you also need a Print-Master utility ROM. I have no direct experience of this, but the variability among printers (even of the same make) and the general cussedness of printer control codes makes me sceptical about the wisdom of attempting such routines in a ROM.

Let me illustrate with two problems I encountered with the Gemini dumps. At first, pie charts came out like elongated eggs interrupted by horizontal hiccups. The problem was spurious line feeds, and once I got the right single-line amendment from Gemini, the dumps worked beautifully - except, as you can see from figure 3, the pie charts are still slightly elliptical. In

page 97 ▶

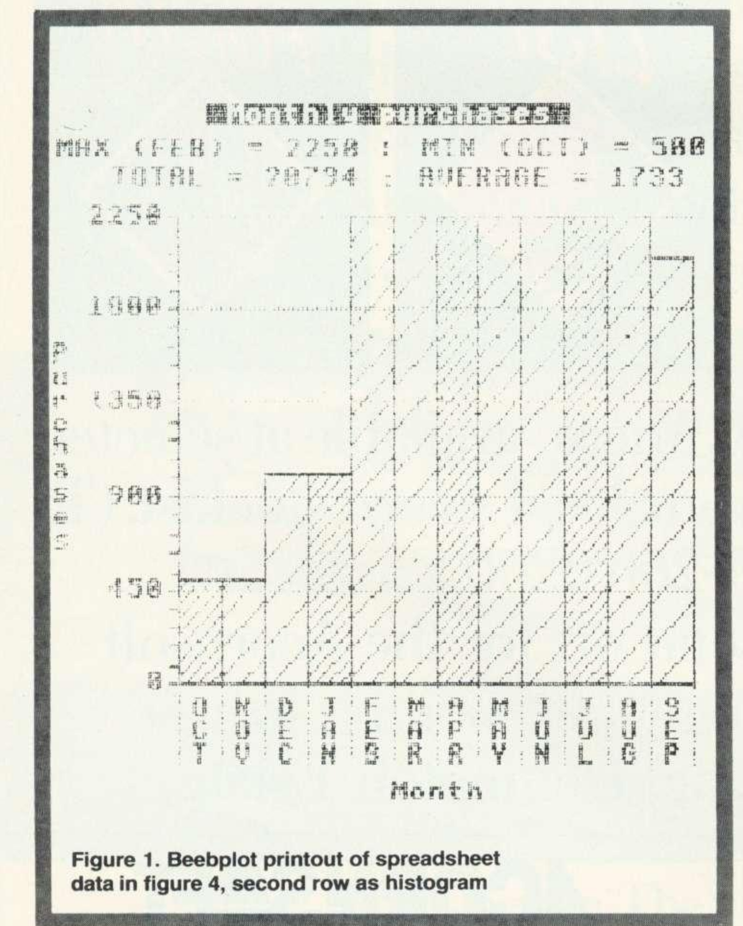


Figure 1. Beebplot printout of spreadsheet data in figure 4, second row as histogram

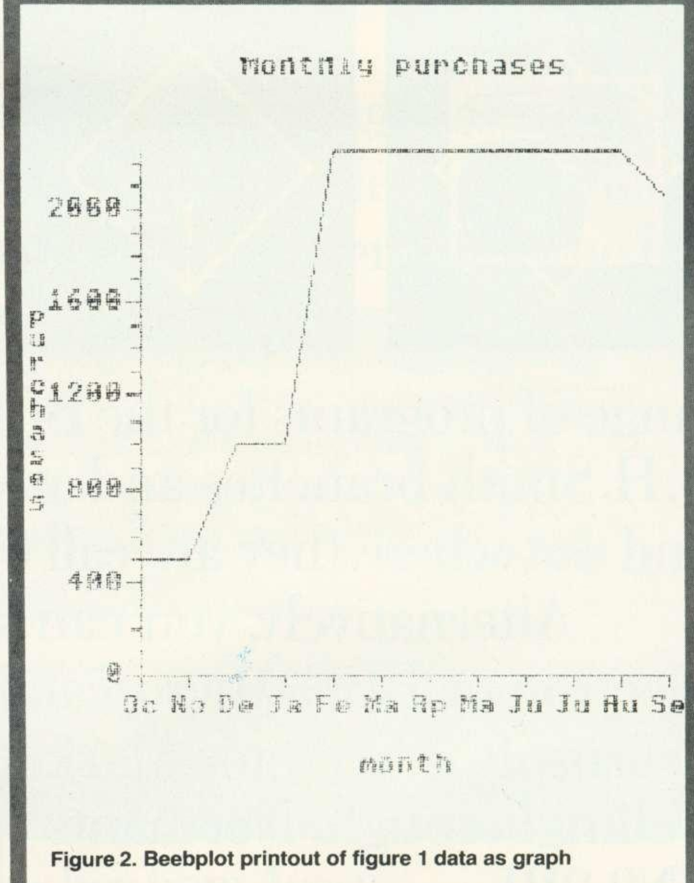


Figure 2. Beebplot printout of figure 1 data as graph

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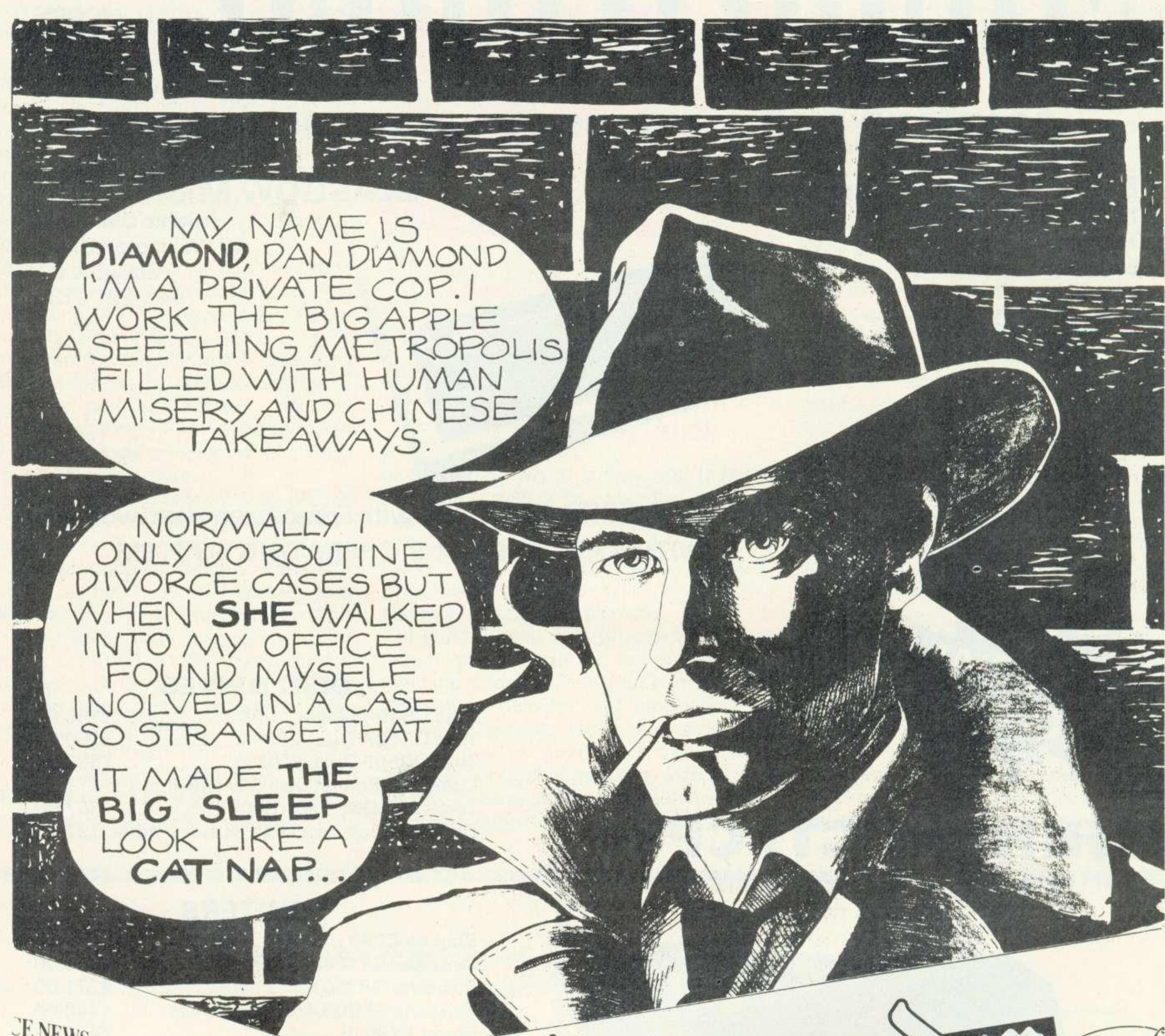


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CE NEWS

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WINS DERBY

HUNT WINS GRAND PRIX

At yesterday's Monaco Grand Prix, a hunting party strayed onto the track at the climax of the race. Cars were halted as the hounds rampaged around the circuit. "The whole place has gone to the dogs," one driver was reported as saying. The race was restarted; riders and drivers battled bitterly around the course before the Hunt thundered past the finishing line to take the chequered flag (it hasn't been seen since).

PLAYER WINS OPEN

Eagle eyed spectators were privileged to see player score a birdie at fifteenth. The

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PRIVATE DETECTIVE DISAPPEARS

Police are baffled by the disappearance of Dan Diamond. He was last seen approaching the eerie edifice known as Franklin's Tomb, but the authorities are completely unable to find any trace of him. Citizens are asked to report any information relating to his disappearance immediately. For further details, buy FRANKLINS TOMB, a new adventure game for the BBC MODEL B. This adventure comes complete with a 24-page illustrated Case File. £9.95 from BOOTS, SPECTRUM, COMPUTERS FOR ALL, WEBSTERS and all other purveyors of quality software. Don't miss it!

BANANA DICTATOR SLIPS UP

El Toro, dictator of

2 DEAD IN EVEREST TRAGEDY

The Everest Expedition ended in tragedy yesterday as Carl and Fre plunged down a crevic to a grisly death. Han the expedition lead was quoted as sayi "Yuk". *Continued on pag*

COLD WAR ON XARG ESCALA

Thousands dead in Ice Storm

Muduras the Mu said yesterday wished I never star

► page 94

J.B. SNOOKER T/A POT BLACK
PROJECTED CASH FLOW YEAR ENDED 30th Sept. 1983

	Oct. £	Nov. £	Dec. £	Jan. £	Feb. £	Mar. £	Apr. £	May £	Jun. £	Jul. £	Aug. £	Sep. £	Total £
INCOME													
Sales	11786	10944	10944	15946	20944	20944	20944	20944	20944	20944	20944	20949	217177
	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------
REVENUE EXPENDITURE													
Purchases	500	500	1000	1000	2250	2250	2250	2250	2250	2250	2250	2044	20794
Advertising	500	1000	1000	1000	1000	3500	3500	3500	3500	3500	3500	3756	29256
Director's salary	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596	1596	1602	19158
Salaries	2216	2216	2216	2216	2216	2216	2216	2216	2216	2216	2216	2224	26600
Rent			375			375			375			375	1500
Telephone		300			300			300			300		1200
Insurance		200							100				300
Printing,stationery		400		200			200						800
Repairs & renewals				250			250						500
Hire of equipment	60	60	60	60	60	60	60	60	60	60	60	60	720
Motor & travel	500	500	500	500	500	500	500	500	500	500	500	500	6000
Sundry	200	200	100										500
Accountancy	250	425					1175						1850
Finance charges			250			250			250			250	1000
Commission			250			250			250			250	1000
Contingency	100	100	100	100	100	100	100	100	100	100	100	100	1200
CAPITAL EXPENDITURE													
Fixed Assets	100	500	500	1000	1000	1000	1500	1500	1000	500	500	930	10030
Vat			2293		4104			4104			4104		14605
	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------
TOTAL EXPENDITURE	6022	7997	10240	7922	13126	12097	13347	16126	12197	10722	15126	12091	137013
	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------
NET INFLOW/OUTFLOW	5764	2947	704	8024	7818	8847	7597	4818	8747	10222	5818	8858	80164
BALANCE B/FWD	-4715	1049	3996	4700	12724	20542	29389	36986	41804	50551	60773	66591	-4715
	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------
BALANCE C/FWD	1049	3996	4700	12724	20542	29389	36986	41804	50551	60773	66591	75449	75449
	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	======

Figure 4. Cash flow printout illustrating varying column widths of Gemini's Beebcalc

practice, it hardly matters, but it's a neat reminder of the fallability of people and computers. Incidentally, the pie charts section doesn't link directly with Gemini's Beebcalc though it does with their Cash Book program.

Turning to Gemini's spreadsheet program itself, it is again in output presentation that it scores so heavily. The first Visicalc suffered from the same flaw as Computer Concepts' Beebcalc: you *can* change the column widths, but not individually.

Real-life spreadsheets aren't like that. You might want quite a long label, followed by lots of five-digit monthly entries, with a six-digit totals column at the end (as figure 4). A uniform column width would lead to cryptic abbreviations of text and spurious gaps between columns which are just as bad for legibility as the 'rivers of white' in a badly-justified piece of word-processing.

For a beginner, the Gemini program is more approachable (although its manual seems less so). You have more flexibility about the order of entering formulae, and do not as easily get into trouble for defining relationships with cells you haven't reached yet. It is also very forgiving to those who realise too late that it would have been better to have an extra column or row; it allows you to add up to two each way (or delete any number), and if that isn't enough you can always save and re-load.

Nevertheless, the Computer Concepts' program is superior in some respects: it tolerates both upper- and lower-case input (Gemini's doesn't). Computer Concepts has transferred the excellent *Wordwise* conventions on cursor control, made similar good use of the function keys, and provides a handy facility for editing cell entries. These ideas could be taken up with profit by Gemini.

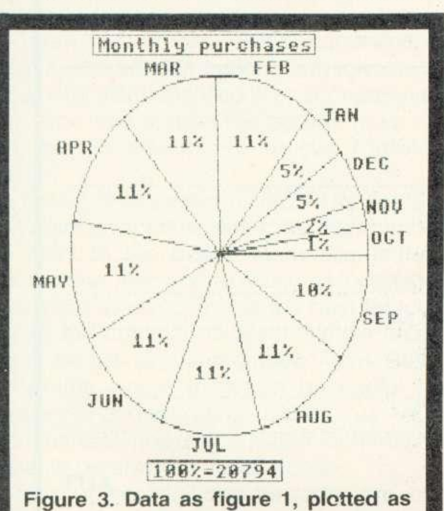


Figure 3. Data as figure 1, plotted as pie chart (note elliptical shape)

And perhaps they will be, in future releases. By contrast, because the Computer Concepts program is on ROM, it cannot be modified by the user. Admittedly, there are benefits in the ROM format: it can hold more (up to 99 by 26 cells, instead of 50 by 26) and allows mode 3 (80-column) display. However, I suspect that if you really need to process 99 by 26 spreadsheets you may find any program in Basic too slow (and will probably find the BBC micro's memory too limiting).

I can't imagine wanting to use a spreadsheet without wanting to display, print and save the results, so I'd rather have the flexibility of disc software; it's quick enough to load, and Gemini's neat system with dots lets you know what is happening. Their Beebcalc and Beebplot are well-designed, workmanlike programs; both represent superb value for money - even more so in combination. If you only have a cassette system, a ROM has to be more tempting; doubtless some schools and colleges will be happy to settle for the Computer Concepts' program for teaching. If you're in a hurry, that might be a good decision.

But if you can afford to wait, save the £40, put it towards a disc drive and watch developments. Both firms are producing improved versions, said to be ready early next year. Gemini's Beebcalc II will be a ROM, and Computer Concepts' new ROM is expected to cost around £60. Acornsoft's View Sheet will add to the competition.

MUST FOR ADVANCED OS USERS

Advanced User Guide for the BBC Micro by A. C. Bray, A. C. Dickens and M. A. Holmes, Cambridge Microcomputer Centre, £12.95

THE Advanced User Guide for the BBC Micro looks exactly like the official *User Guide*: it has a black glossy cover, is spirally bound and bulky (512 pages). Although it is obviously produced with Acorn's help (duly acknowledged) and possibly their blessing too, it is not an official publication. Nevertheless, it is an extremely useful one, pulling together a lot of interesting material on the machine operating system. However, I think it is slightly misleadingly titled, a point I shall return to at the end.

The first section of the book deals with the standard OS commands. This is a useful reference section, although most of the information is already available elsewhere.

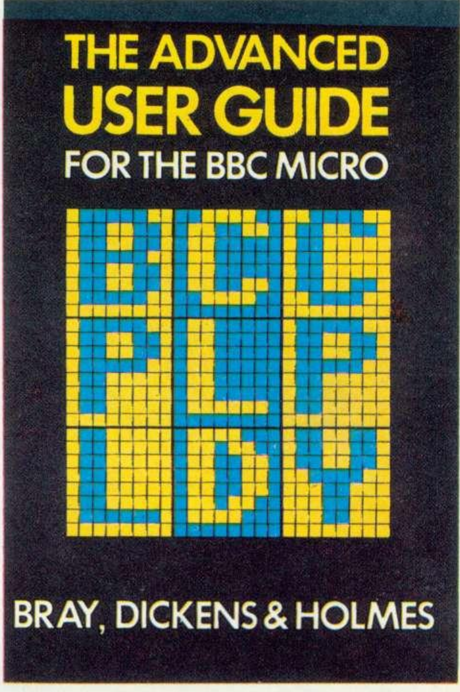
Section two deals with the assembler, and it is this section of the book I find most disappointing. It is far too brief for anyone new to assembly language programming (only 20 pages of exposition, a further 60 doing nothing more than summarise each instruction), and it is an unnecessary summary for those who know assembler, since they will already have this information. A wasted 80 pages, in my view.

The third section deals with the OS calls, including a very comprehensive section on FX calls; vectors and interrupt processing; memory usage up to page IB and a short summary of the MOS ROM at &C000 onwards. It also has a detailed discussion of the paged ROM filing system. However, other filing systems, disc and cassette, are only cursorily treated, discs getting just half a page.

The last section on the hardware has comprehensive coverage of the video circuitry (6845) and ULA, on the RS423 (continued from the previous section), on using the 6522 VIA, and on the 1MHz bus. There is also a useful section on the analogue to digital converter, but the sections on Tube, disc and Econet interfaces are brief and not particularly revealing.

Finally, there are 11 appendices, including information on screen mode addresses, American BBC computer MOS differences, and some hardware information on the disc upgrade, the circuit board links and keyboard and main circuit diagrams. This latter hardware information is obviously taken from the service manual available to dealers.

In summary, a very useful book, and reasonably priced given its size. However, it is an *advanced user's* guide rather than an *advanced* user guide, for it really deals only with the machine operating system. There is very little on discs etc, and virtually nothing on the intimate details of Basic. If it were titled 'All you want to know about the BBC MOS, for advanced users', I think it would live up to its title, and it should be bought by anyone who wants, and is able to use, such information.



With Acorn's blessing. . . complete with BBC micro circuit diagram

With this qualification, the book is highly recommended.

Ian Birnbaum

SIMPLE MONITOR EXTENDS MOS COMMANDS

BBC Toolkit, Logic Systems, 32k, £8.95

THIS monitor-type utility is for a 32k BBC micro. It has the usual features like disassembly, breakpoint-handling, single-stepping through machine code, memory search, dumping, alteration, checksumming and block moves, and relocation of machine code.

There is a helpful *TOOL command to display the various options and formats. A neat little instruction booklet accompanies the tape and though the booklet does not say so, it is possible to transfer *Toolkit* to disc.

Toolkit is executed using *RUN and the initialisation routine alters the CLIV vector to point to the toolkit interpreter. It then returns the machine to Basic and waits for any valid request. This is the best feature, as all the commands are in simple MOS-type format and accessible from Basic programs where they can be useful for testing and debugging. Unlike true MOS commands, however, *Toolkit* commands have to be always in upper-case.

Most of the additional functions are reasonably effective, especially the fast disassembler. Memory can only be altered in hex. The user is also restricted to having only one breakpoint, which can be limiting when testing out machine code multiple processing paths. The utility takes up almost 3k of space from &7100 onwards and during initialisation, HIMEM is altered to reflect this limit.

The CLIV indirection vector is also set to address &719F, which is a major snag. Having a fixed vector means *Toolkit* can only be run in teletext mode as all other modes need the address space occupied for their screen. It is an extremely stifling limitation as a lot of programs would normally need to operate in the other graphic screen modes. It is possible to use *Toolkit* to relocate itself down in memory when using other modes, but the instruction booklet does not explain how to perform this messy procedure. As it stands, it is necessary to terminate *Toolkit* by a *SHUT command before changing over to another mode, and reloading it when returning to teletext, otherwise some really strange things happen, such as programs crashing with ERR 0, etc.

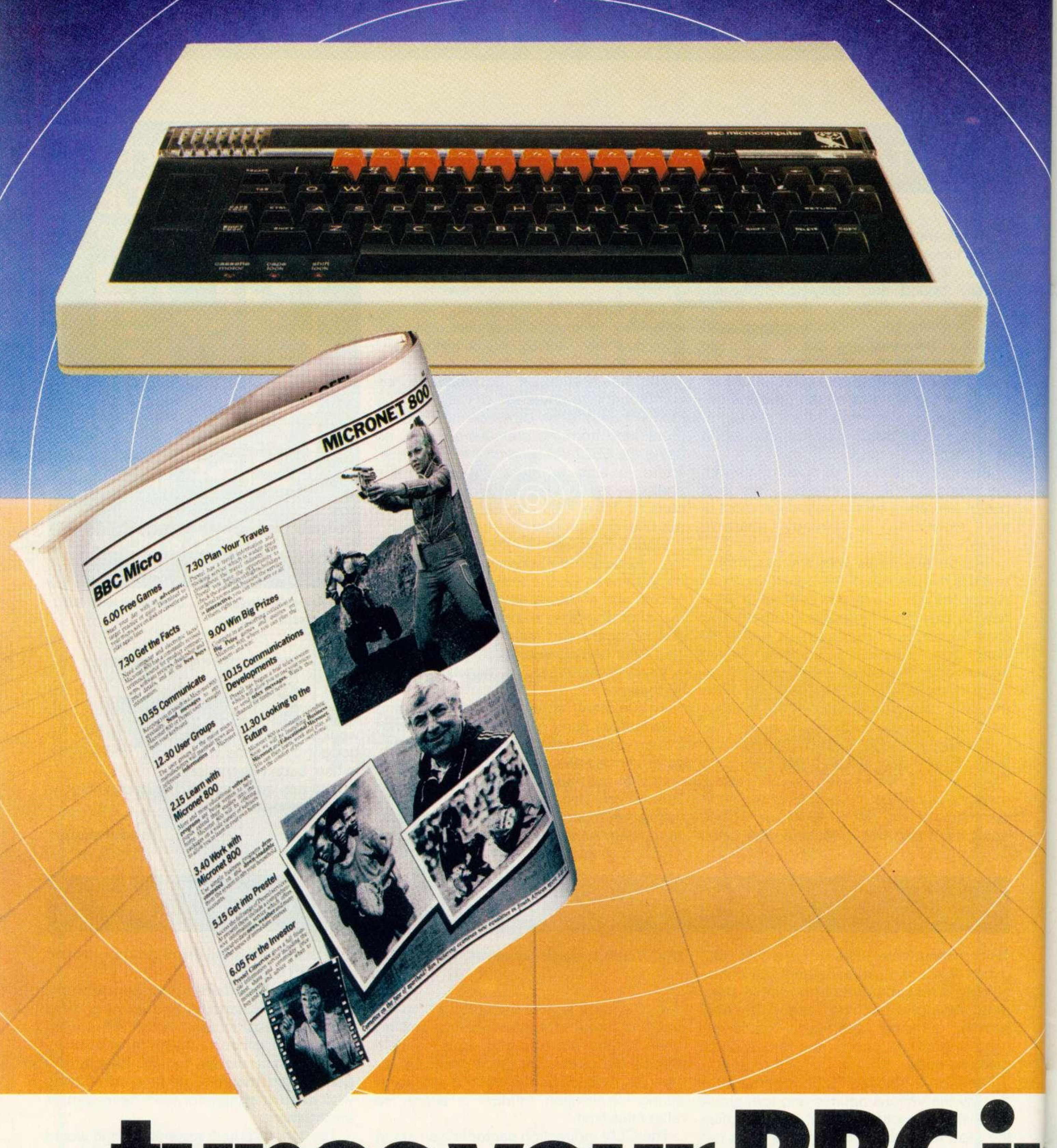
All in all, *Toolkit* does represent a simple method for extending the existing MOS commands to include more debugging aids, which will be its main selling point. Its main market would be for people just getting into machine code programming who need a straightforward development environment.

The more serious assembler buff would probably find that, for the price, it does not appear as comprehensive as other monitors on the market.

Here is a complete list of *Toolkit* commands: BREAK, CHECK, DIS, FIND, HEX, MOVE, MEM, RELOC, SHUT, STEP, TOOLS, XEQT. *Toolkit* requires addresses &50 through &64 in pages zero for its workspace and does not affect the normal page zero scratch space between &70 and &8F.

BBC Toolkit is available from Logic Systems, 129 High Street, Cherry Hinton, Cambridge. Tel: (0223) 210669. Price: £8.95.

C. Chan



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CHESS (Model A £5.95 Model B £7.95)
Our excellent machine code program — now with superby MODE 1, colour graphics. Six skill levels, play black or white, illegal moves rejected, 'en passant', castling, take-back of moves, and include Blitz Chess where you must move in 10 seconds, set-up of positions for analysis, replay of a game just played and saving of part completed games on tape. On loading, a 1972 Spassky/Fischer game can be replayed.
DANGER! UXB
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OUT WEST

Gunsmoke, Software Invasion, model B, £7.95

I'VE ALWAYS fancied being in a wild west shootout and *Gunsmoke* from Software Invasion made me feel like one of the magnificent seven.

After the title page and instructions, the background graphics screen is loaded. This depicts a classic wild west setting of bars, hotels, sheriff's office and stores. Finally, the game is loaded and announces itself with a western theme song.

To play the game, you control the gunman in the foreground and the object is to shoot down the bandits who pop up inside (and on top of) the buildings. Needless to say, the bandits are shooting at you! The gunman is controlled from the keyboard and you can move him left or right and control the angle of his gun and firing. An extra 'life' is gained after shooting 16 bandits (you start off with three).

At first, I was being shot so often I wondered whether I had any future in the gunslinging business. But with practice the second screen came up, where day turned to night and I was faced by not just one bandit but two. I was quickly laid to rest by this onslaught!

The graphics are good, as are the music and sound effects. Overall, I was impressed with this offering and look forward to other releases from Software Invasion.

Jeremy Vine



FAST DRAW

Easy Graphics, Hexagon, Model B, £13.50

BEING quick on the draw helped me with Hexagon's *Easy Graphics* package. It comes with the main graphics program; 'Redraw'—for running saved pictures and a demonstration program. The package also contains a ten-page booklet with a function key overlay and a 'break protector' (a strip of card placed over the key!).

The main program contains many of the functions found in more expensive drawing packages (*Acorn User*, June). Lines are drawn using the cursor, alphabetic and function keys. The fill routine is run by defining the area to be filled and therefore avoids the problem of escaping colours through broken boundaries. Circles, ellipses and polygons can be made from a function key routine and be produced in part or full, at the choice of the user. There is no permanent on-screen information on the cursor position, though this can be found by pressing 'X' for X,Y position and 'D' for distance. I found this to be an awkward procedure and this information should be on-screen the whole time.

The program can be run in any graphics mode and options exist to change colour and pallette. Two nice options are the use of rubber bands and an alignment grid which enables the user to position view lines before being drawn.

There are, however, some annoying features. What is seen on the screen is not always the same as the picture stored in the array! (This can be seen by pressing the copy key.)

Pictures can be saved on tape and used later by running the 'Redraw' program. This can be listed so pictures can be used in your own program. However, it is riddled with GOSUB statements, something I find totally unnecessary considering the availability of procedures. The information about the picture is held in an array and stored in DATA lines on the 'Redraw' program. Redrawing can be slow, and is shown by the demonstration program which is both unexciting and snail-like in parts. The main program is poorly error-trapped and fatal errors can occur from pressing the wrong key. The manual is adequate, though it could contain better examples.

Easy Graphics is cheaper than some other drawing packages on the market and for the price is a reasonable offering, though lacking in the professionalism of more expensive packages.

Jeremy Vine

FUNCTION KEYS		CTRL KEYS		UPPER CASE KEYS		COLOUR CODES		
						LOGICAL NUMBER		COLOUR
						Fore-ground	Back-ground	
f0	Start Repeat	A	Change Mode	A	Examine array			
f1	Enter k,x,y and end of fill.	C	Clear screen	C	Cursor on			
f2	Enter x,y.	K	Change plot function	D	Measure distance	0	128	Black
f3	Change colour (GCOL)	L	Change line numbers	E	Erase line	1	129	Red
f4	Fill - define centre	N	Change N, T and R to erase part of array	G	Alignment grid	2	130	Green
f5	Polygon	P	Change pallette	L	Draw line/list array	3	131	Yellow
f6	Type	R	Reset array	M	Move	4	132	Blue
f7	Start rubber band	W	Wait	O	Cursor Off	5	133	Magenta
f8	End rubber band			P	Plot point only	6	134	Cyan
f9	End repeat			R	Report state of arrays	7	135	White
				S	Change speed			
				X	Report x, y co-ordinates			

Command summary table from Easy Graphics

MIND BENDERS

Games of Logic and Cunning, Golem Software, 32k, £8

FIVE programs are supplied in this set of puzzles and mind-benders—all designed to cross your eyes and turn your brain to scrambled egg. At first some seem impossible and the temptation is to give up. The trouble is, if you do, you will never learn how to solve the conundrum – because Golem don't supply answers!

First on the tape is *Auction* in which the player bids against the computer for valuable antiques – a variation on the old idea of 'Race you to a number'. The problem comes in not allowing the computer to get the last bid on to the target price. With unerring skill, the machine always seems to steer things so your last bid leaves the way open for its coup de grace. The program covers all illegal moves and is generally fun to play.

The second of the set is *Flip* in which one must discover the sequence of moves the computer uses in 'flipping' double-sided characters on the screen and thereby changing their pattern. I found this program disappointingly easy, as it demanded no understanding of the underlying principle.

Reverse won't run on a disc-based machine as the DFS takes up memory – so it has to be relocated. A tidy piece of animation in this program, with letters skipping around the screen as you try to put a simple line of letters into alphabetical order. Sounds easy? Try it!

Telepathy is an exercise in computer ESP and this reviewer still doesn't know if he was being conned!

The final program on the tape was *Hexa15*, a sliding block puzzle using hexadecimal digits up to F. Another good example of neat animation here, although the reward for success was incredibly unimaginative.

On the whole this package is good value and provides slightly more taxing entertainment than blasting aliens.

Nick Evans

A TOUCH OF THE UNUSUAL IN ATOM ROM

THE Disatom 'toolbox' ROM comes housed in an anti-static case, with a comprehensive manual, containing fitting instructions, details of all new commands and example programs. In addition, you get a small summary sheet, intended to be kept by your machine. The manual is written by Messrs Stevenson and Rockett, who are to be congratulated on the excellence of the documentation.

Once fitted, the ROM is active all the time, but you *must* have the floating point ROM fitted. I feel this is a mistake, but Procyon says its makes the package easier to use and they think most Atom owners will have it anyway. A full list of commands is given in table 1 and, since some of these are 'standard' and have been described in previous reviews, I have confined myself in table 2 to those that are unusual—in some cases, very unusual.

As well as the new commands, there are six special functions available by single-key entry (table 1). When using the first four (↑, D, H, A) the mode is shown as the first character of each line. Pressing escape will stop and allow you to change modes. It will also allow you to directly edit the code (using hex or ASCII format) by using the cursor keys as you would in editing a Basic program.

Disatom is very different from other toolboxes and a lot of thought has gone into providing routines that are not only useful, but original. As a result, although it has some 'standard' features, it also has many unusual and exciting routines and should properly be regarded as being complementary to more normal toolboxes. The documentation is first class and I have no hesitation in recommending this ROM to all Atom users, beginner or expert.

At £22.95, it is good value from: Procyon, 57 Westgate, Cleckheaton, W Yorks.

Table 1. All new commands

HIGH (1200 baud COS)
LOW (300 baud COS)

AULD	AUTO	COPY	
CURSOR	DELETE	DUMP	DIR
ERUN	EXEC$	FIND	
HEADER	HELP	INKEY	NUKE
ON ERROR		OUT	
PAGE	PULL (pop)	REN (umber)	
READ	DATA	RESTORE	
TAPE	TONE	ZERO	

[↑] [D] [H] [A] [T] [X]

Table 2. The unusual commands

DIR provides a list of the ROM's reserved words and function keys.

AULD xx performs an OLD, but at the page specified by xx. (A page is a 256-byte block of memory.) In other words, it moves the 'text space pointer', so you can call a program in a different part of memory.

PAGE xx moves to page xx in memory and performs a NEW, so you can write a program there.

NUKE described as 'a really thorough NEW' – it's more like a 'total destruct' routine, since it writes #FF into *every* location up to #7FFF and then executes a break (to restore block-zero parameters). It's intended to see what effect a subsequently-loaded program has on memory.

COPY x,y,z moves a block of memory (contained between addresses x and y) to begin at address z. Overlapping is automatically taken care of.

ERUN runs a program but, if an error is found, it prints out the offending line in full, with the cursor over the character that caused the error. Neat.

DUMP prints out the current value of variables, but *only* those actually used by the program present.

FIND " . . ." has four modes. It can be used to find:

- all occurrences of the quoted string.
- location (address) of any sequence of ASCII characters.
- location of any reserved word.
- location of any sequence of hex (or mnemonic) code.

This is a most unusual and very powerful routine.

EXEC$ executes the named string as if it were a line of Basic. It has two uses. The first is to provide a conditional Basic command and the second, and more powerful, is to give an equivalent of EVAL (from BBC Basic).

HEADER allows up to six lines at the top of the screen to remain static, whilst the rest of the screen scrolls. Useful for printing long tables.

INKEY this is the only version of INKEY that I know of, for the Atom, which works like the BBC version, in that it allows you to set a time limit on its operation. Up to 27½ minutes can be set.

TONE x, $y a BEEP routine, where x is the duration (up to 6½ seconds) and $y is the pitch. $y has two characters: the first is a number from 1 to 5, to define the octave, and the second is a letter, A to G, to define the actual note. In addition, you may have '+' for a sharp, or '-' for a flat. 'R' gives a rest. Now, whilst this is a good way of defining a tone, it is cumbersome to implement here and this is my least favourite command.

OUT this provides a standard RS232 output, via the cassette port, with selectable baud rate and adjustable linefeed, with or without handshake. Full wiring instructions for the DIN plug are given in the manual and it should work with most serial printers (but don't expect it to work with teletypes). You could justify buying this ROM for the OUT routine alone!

HELP is used instead of LOAD, if you are having tape problems. It will display each type of incoming data at the cursor and report sum errors, executing an automatic *FLOAD to allow you to try again, without having to go back to the start.

TAPE xxxx another problem tape routine. This fetches *any* data from tape, stores it at location xxxx and also displays incoming data (including titles, destinations and checksums) on the top half of the screen, so that you can see what's coming in. The data can be examined and any repair made. There have been times when I would have given an arm and a leg for this facility!

Special functions available by single-key entry:

[↑] (inverted up-arrow)
forces temporary 1200 baud operation, reverting to 300 baud, when loading is complete.

[D] (shifted D) standard disassembler. The format is:

address/op-code/data/mnemonic/address or data/ASCII

Jump addresses are resolved (except indirect ones).

[H] (shifted H)hex dump routine. Format is:

Address/8 bytes of code

[A] (shifted A)
ASCII dump. Displays ASCII characters instead of hex, if the code is in the ASCII range, otherwise it displays normal hex.

[T] (shifted T)
a proper TRACE routine! It allows single stepping of a machine-code program and displays the current address, the assembler mnemonic and data, the current contents of all the 6502 registers and the state of the flags. In addition, you may set up values in the registers at the start of the trace and you have the option of ignoring or executing jumps.

[X] (shifted X)
means expansion! This routine allows you to set up a machine-code routine at a suitable address and then call it from within a Basic program. Only one such routine can be defined, but it will be available as long as the machine is switched on.

As Reviewed in July Acorn User and July Laserbug

MICROVOC

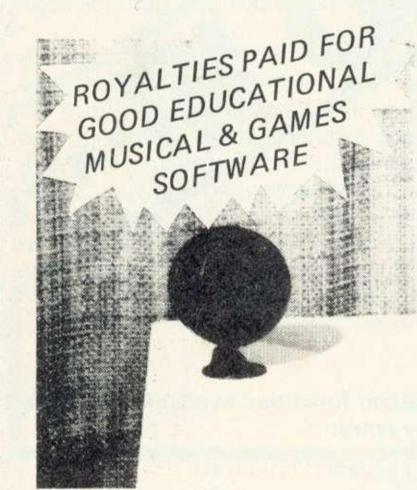
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FINE WAY TO EXPOSE PEOPLE TO ASSEMBLER

Assembly Language Programming on the BBC Micro, by John Ferguson and Tony Shaw, Addison Wesley, £7.95

I HAVE used many assemblers in my time on Commodore and other machines. Indeed, my first computer (an SYM 1) had a built-in assembler and text editor which could be linked to Basic with care! However, the arrival of BBC Basic with its built-in assembler means more people will be exposed to the idea of machine code and the exciting increase in speed.

This is really one of those books that fills the blank when the question 'What do I do with my micro now?' occurs. And 13 chapters with eight appendices in a book of 200 pages will keep you busy.

The micro and its relation to ROM and RAM is explained, with hexadecimal notation and ASCII introduced, at the start. The indirection operators (peek and poke of the old days) are clearly explained and some simple Basic programs to play with memory are given.

We then pass on to the microprocessor – a nice distinction is made here. Each of the instructions of the processor is introduced beginning with LDA and STA. We are not pushed into using the assembler, but get a Basic loader to start with, and the idea of a CALL in its simple form and the importance of RTS is given. (An important point for one whose machine code programs have been known on occasions to continue to infinity!)

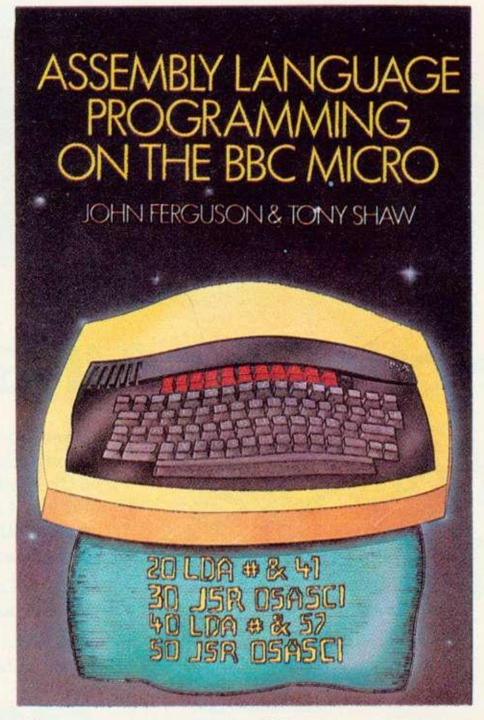
At the end of each chapter there are examples to try out; a sensible idea. The reader gets so much from a book like this, it's just a shame the publishers did not include a couple of blank note pages before the start of the next chapter.

Having sweated over hand coding, chapter 3 introduces the assembler, square brackets, the meaning of P% and the fact that we can put labels and comments in the program – even more vital than in Basic.

The BBC has a tight memory allocation, which is not surprising when you consider what it can do, and the authors go to some trouble to suggest where to put machine code.

The use of subroutines and their use, as well as calls to the operating system addresses are dealt with. A clear explanation is given of the problems of stack handling by using diagrams: a welcome feature throughout the book.

Branching and comparing, indexed addressing, indirect indexed addressing, it's all here. The old 6502 is really quite good if you use it properly!



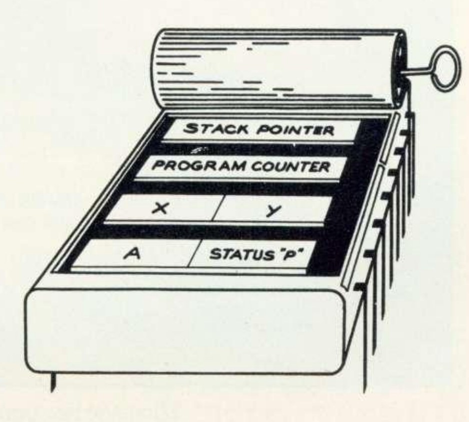
Clear, reassuring assembler book from two *Acorn User* authors

Lots of interesting applications relative to the BBC are all described, for example, passing VDU commands, creating and executing a text command file, linking to Basic and passing parameter blocks via the CALL command. Each section has a mock display of the screen, or print-out of what it should look like if you run the program, which is reassuring to the beginner.

Finally, interfacing and interrupts are dealt with. Dangers of misuse are as clearly explained as real uses.

I cannot recommend this book too highly for a complete beginner with the 6502 or as retraining for an experienced programmer new to the BBC. I've already had computer students of mine queueing to use it. Ferguson and Shaw's book will remain popular for a long time.

Paul Garfield



6502 registers, the Ferguson and Shaw way

SHIRTS IN THE WOOD

Mystic Wood, Atom, £6.90, A&F Software

MYSTIC WOOD is what, nowadays, is termed a 'graphic adventure' although it's really a sophisticated maze game. The object is to journey through an enchanted wood in search of a lost child. In the wood are witches, giants, spiders and shirts(!), all of which sap your strength if you bump into them. There are also gold mines, from which you may collect treasure. Having found the child, you then have to escape from the wood. All of this is done in real time, which clocks down on the screen.

The action is displayed on a mode 4 screen, which also shows your current strength and experience status. Four keys are used for movement and there is no time to waste, if you are to complete the mission. At the end of each game, points are awarded according to your performance, and a high score is provided. Sound effects are superb and plentiful, as are the graphics.

Because of the length of the program, there is no room for on-screen instructions, so these are provided on a separate sheet. As such games go, this is a reasonable implementation and I suspect it's a game you will either love or loathe. Personally, I found it boring after a few sessions, but the final verdict must be yours.

Barry Pickles

CANADIAN CROSS

Starburst, Atom, £5.75, A&F Software, 890 Hyde Rd, Manchester M18 7JD

STARBURST is, apparently, a popular arcade game in Canada and, as far as I know, this is the only version available on a micro.

It seems to be a cross between *Invaders* and *Asteroids*. The screen displays a rocket ship which you have to steer upwards, avoiding the mines and the attacking alien ships, to hit and destroy the asteroids. To make things more difficult, the screen is constantly scrolling sideways and the action gets more intense as the game develops.

You get three lives and the screen shows the current score and high score. Instructions are provided at the beginning of the game and, each time you hit an asteroid, the score is momentarily flashed over the target. There are a number of skill levels but, curiously, no extra points for harder levels. Although it sounds easy, the game is deceptive and quite addictive.

Barry Pickles



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TOADSTOOLS AND DRAGONS IN MODE 7

Granny's Garden, 4mat, model B, £10 (£12 disc)

GRANNY'S GARDEN is a delightful 32k adventure for young children from 4mat Educational Software. In this adventure you are transported from 'Granny's Garden' to the Kingdom of the Mountains where the wicked witch has imprisoned the King and Queen and their children.

The adventure is in two parts and your task is to rescue the children, by going through four different locations solving the puzzles. During the fantasy trip you will meet a talking toadstool, magic raven, spider, dragon and a host of other characters. To complete each part of the adventure various passwords must be found. The tape comes with a helpful booklet for the teacher or parent, and suggests a number of ideas for further discussion from the program.

The program is well presented in mode 7 and contains colourful teletext graphics with occasional moving pictures and sound. Throughout the program only one-word responses are required. One feature that caught my attention was incorrect spellings being accepted. This would be fine if the child were corrected on the spelling and allowed to continue, but the program makes no correction of spelling mistakes it accepts. Error-trapping is somewhat erratic, allowing a child to sometimes enter rubbish and have it accepted as a valid answer.

These are problems which should not exist in educational software and are flaws in what is otherwise a well thought-out program. Despite these criticisms, this is a good attempt at an adventure game at a very young level and a trend I hope to see develop.

Jeremy Vine





Nasties and pretty views in Granny's Garden, a children's adventure

PUB-STYLE BRASS

Snooker, Acornsoft, BBC B, £9.95

AT LAST another game for two players. *Snooker* follows the same rules as the real game and even has an authentic 'brass' scoreboard, pub style. If you can get used to the cue being in front of the ball (think of it as a rubber-banded pointer aimed at the ball you want to hit) and are not put off by the brown ball being a flashing magenta, you'll have a lot of fun.

It has 'top' and 'backspin', but they're not adjustable and the sound effects are not as authentic as *Billiards* from H & H Software, but the graphics are good and the action, if slow when there are lots of balls on the table, is pretty real. You can't knock the ball on to the floor either. But be warned, if you play this game for long periods, everything around you will appear a very rosy pink. *Snooker* is by Kevin Reid.

Alan Pipes

KONG MEETS GORILLA

Killer Gorilla, Program Power, BBC B, £8.63 (inc VAT, post)
Zany Kong, Solar Soft, BBC B, £6.50 (inc VAT, post)

WHO would have thought five (two?) years ago you could have an Italian carpenter dashing up your TV screen, leaping over barrels and gaps in girders, smashing bowls of custard with a huge hammer and avoiding oily fireballs, all to save a feeble maiden from a mad gorilla. Pretty sexist, huh?

The *Donkey Kong* games are the state-of-the-art in BBC graphics. Donkey? Yes, it should have been Monkey Kong, but some Japanese gent made a typo and the name stuck.

Of these two derivatives for the Beeb, *Killer Gorilla* wins for me. It has crisper graphics and inventive if irritating sound effects (which can be switched off). And the action's faster, but then it is £2 dearer!

So up comes the first screen. PP's Mario is at the bottom of the screen. You use Z and X to move him along the upwards sloping girders; ★ and ? to make him climb ladders. Press return and he jumps the barrels rolling down from the top, or the fireballs rising from the bottom. He can hide up or down broken ladders while the hazards pass by (you can't hide *up* the ladders on *Zany Kong*).

If he jumps while standing under a hammer, he gets a few seconds of revenge – bashing the barrels and fireballs for points. With *Zany Kong* you have to be exactly under the hammer – with *Killer Gorilla* you don't have to be so precise, a running jump will do it.

Zany Kong uses the space bar for jumping and the fatter hero's reactions are rather slow – you have to jump well in advance of a hazard. But at least their gorilla moves when he rolls the barrels and the fireballs are more realistic. All the time, a bonus is ticking away. Take too long and you'll die of exhaustion.

Get to the top and you're on screen 2. Here Mario (it's Maurice on *Zany*, by the way) has to climb ladders and negotiate conveyor belts, but doesn't actually have to get right to the top to progress to level 3. Here's a tip – on *Killer* you can climb half way up the moving ladders whether they're there or not, just mind a fireball doesn't get in the way. And take no notice of the gorilla, it's harmless. On this round you can collect bags and umbrellas along the way for extra points. Nice touch on *Zany* – revolving wheels on the conveyors.

Screen 3 is nigh-on impossible. But persevere with the timing (press Z just a microsecond before you jump) and you'll be leaping from scaffold to lift like a frogger. And pray that fireball doesn't hang around too long at the spot you need to be.

Screen 4 took me by surprise. I didn't have a clue what to do. There are plugs that disappear as you go over them (you can jump the gaps they leave). When you remove the lot, old Kong collapses along with what's left on the structure.

But that's not the end. You're suddenly back at screen 1, only with gaps in the girders and faster hazards. . . .

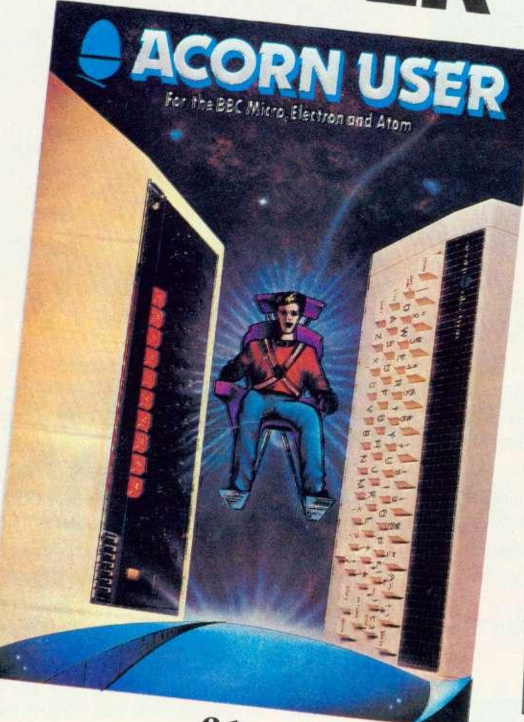
Both games have scoreboards. *Killer* is full of odd names like Compo and Johnny Rotten. You need 1680 to get on the board; 6200 to become top. Zany's scoreboard is virtually illegible, in the Beeb's superwide mode 2 writing.

Killer Gorilla was written by Adrian Stephens; *Zany Kong* by Christopher Hyde.

Alan Pipes

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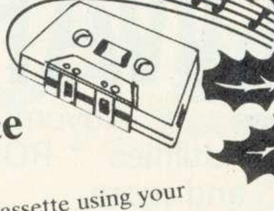


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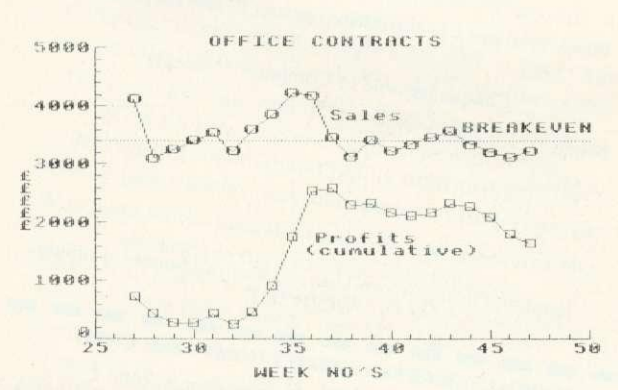
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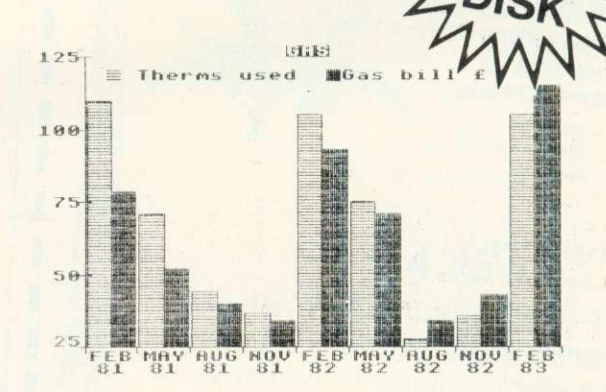
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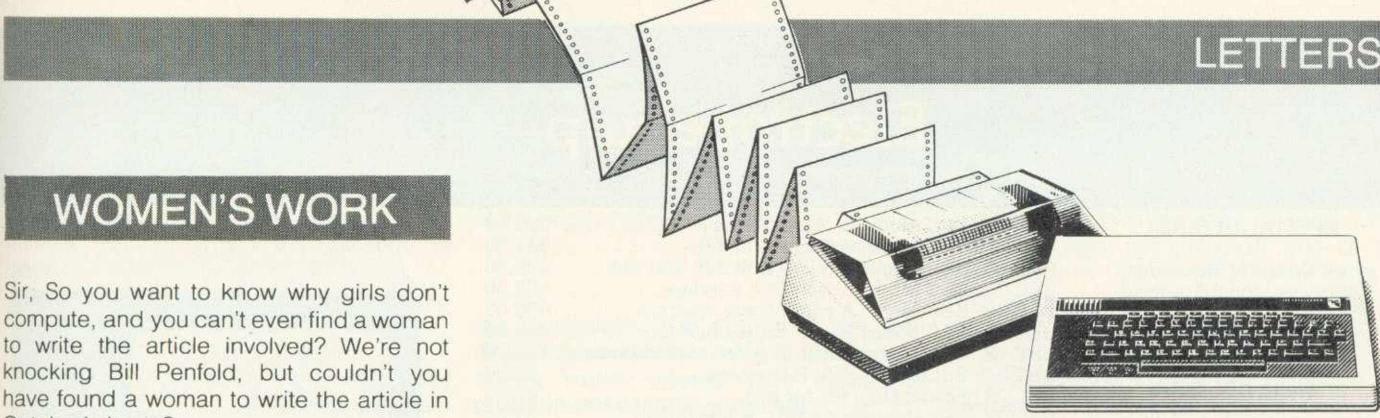
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WOMEN'S WORK

Sir, So you want to know why girls don't compute, and you can't even find a woman to write the article involved? We're not knocking Bill Penfold, but couldn't you have found a woman to write the article in October's issue?

To two women involved in computing, some of the reasons are blatantly obvious.

Let's start with textbooks. For example those provided by the National Extension College—excellent courses by the way—in assembler and further structured Basic, which seem to have forgotten that women exist. And most other textbooks and courses seem to be of the same ilk!

And to go on to why boys, especially young boys at school are seemingly more attracted to computers, there is one simple reason—they all think computing is about writing and playing *games;* their favourites being such as *Defender, Space Pilot* and *Invaders.* Strange how these all seem to be games of warfare—originally designed to be played in public houses by their fathers and elder brothers!

You will note that any girl who plays and gets a higher score than the boys will find they refuse to leave until they have bettered her score—much to the amusement of the girl.

This false impression that games are what computers are all about is perpetuated by an industry desperate to sell small computers to people who don't really want them, and user magazines which know that half the people who buy their product, buy it, not to read the articles but to type in the latest game supplied—as the main feature!

Most youngsters at school haven't the faintest idea what mainframes, minis and business micros are used for, and have never heard of any language other than Basic.

Until recently, all the so-called educational programs have been tarted-up games, and not educational software at all.

Another reason, like it or not, is that most science and maths teachers are men!

Moving on to what could be described as the real world of computers (though a little unfairly), women trying to get qualifications or jobs in computing come across Great Big Brick Walls.

Just one example is provided by a firm (American) that was offering training in Cobol and business programming in Manchester, home of the Equal Opportunities Commission (what a joke!). My colleague, after being refused interviews, complained to the Manpower Services Commission, and was then granted an interview. He (off the record, of course) informed her they did not take women applicants because the firms that provided the money for the training preferred male programmers. This same firm in Manchester refused interviews for other women with degrees we have met.

We know Manchester is one of the most sexist cities in the country with an extremely low percentage of female engineers and technicians, but we should imagine this is a common occurrence throughout Britain.

Finally, programming was first carried out by Lady Ada Lovelace for Babbage's Difference Machine. So this makes programming *women's work* and all the men can get out (and the little boys!) So there!

Helen Cole
Adult education Basic teacher
Christine Norcross
NCC

SHINE A LIGHT

Sir, I have a BBC B with a Torch Disc Pack. I should be interested in hearing from anyone else using CP/M or CPN software on a Torch with a view to exchanging information.

There are various problems I know of—some of which I have the solution to. These include incompatibility between CP/M software and CPN, the missing keys when using CPN software and problems in Basic mode, eg no 'Disc full' message.

My dealer tries to help but is not very knowledgeable and Torch themselves rarely respond to phone calls or letters. Other users have had similar experiences, and it seems, therefore, we must help ourselves.

Grahame Perchick
Wembley

BBC ON SYNC

Sir, In your August issue, you published a letter from P. Sirop about 'shutter' or 'fame jump' on television displays. Mr Sirop suggested that special receiver synchronisation techniques have to be used 'because in remote parts of the country the transmitted TV signal is so corrupted that there are no distinguishable sync pulses.'

Even in remote areas, the broadcasters ensure that the transmitted TV signals satisfy stringent technical requirements, including specifications of the shaping accuracy of sync pulses. It is true, of course, that the received signals may be corrupted by localised problems, such as multipath reception which can cause 'ghosts' on pictures and degrade the shape of the sync pulses. In practice, severe degradation of the sync pulses generally occurs only when the picture is unusable.

The sync pulses of broadcast signals are also very accurate in terms of timing, as they are derived from rubidium frequency standards. In contrast, the timing accuracy of non-broadcast signals, especially from video cassette recorders, is very poor. Synchronisation circuits which depend on the inherent stability of broadcast signals can be unsuitable for use with non-broadcast signals. Many modern television sets have a channel, designated for use with video cassette recorders, on which the response times of the synchronisation circuits have been reduced to give usable pictures despite the inaccuracy of sync pulse timing.

P. Laven
Engineering Information
BBC

SOFTWARE FARCE

Sir, It was with some amusement that I read the news item headlined 'Tough line on bogus chips' in September's *Acorn User.* The same issue has two other items on software security.

No doubt some 'piracy' is motivated solely by the desire for illicit profits, but I feel much of it has another cause — non-availabililty of the genuine article. It is merely a response to hordes of BBC micro owners clamouring for software which the besieged dealer cannot supply. Of all the contenders in the 'available soon' stakes, Acornsoft is probably the worst offender.

First we had the disc disaster. Dealers' shelves groaned under piles of disc drives, but could Acorn provide the necessary chips for the interface? No. The first great chip famine had struck! Slowly supplies began to filter through, many of them the evil non-standard versions.

Being now proud owners of functioning disc-based micros, the more serious minded turned their thoughts to word processing, only to be met by the mystery of the disappearing View.

Recently, an acquaintance bought a BBC machine, with disc drive, word-processor chip and printer. Imagine her amazement on finding that the DFS was a version which Acorn claims has never been issued and the View ROM was pirated, and came with a poor photocopy of only half the documentation. These gems were purchased from a 'BBC Official Agent'.

Lastly I would mention the Forth farce. Go to any Acornsoft stockist, and you will

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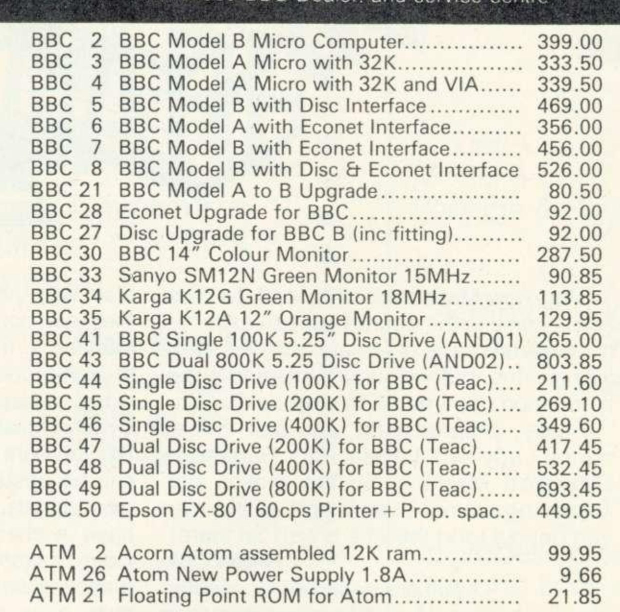
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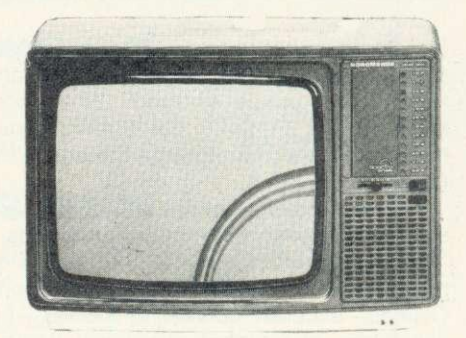
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see displayed the cassette version of Forth. What you will not be offered however is the manual, without which the cassette is useless!

Before Acorn and Acornsoft can make credible complaints about piracy they really must put their own house in order.

P. Moody
Birmingham

SELF-DESTRUCT

Sir, I have a BBC model B micro with OS 0.1 and, having tried some of the programs and hints in the April issue I would like to state a problem or two I had.

First, when I entered the program into my machine I also included the *self destruct/escape mechanism* mentioned in the Beeb Forum, but when the escape key was pressed the computer suddenly became silent! Is this true of all models or just those with OS 0.1?

Second, I included the mechanism in a program which asked for a number to be entered. When escape was pressed, the line was executed repeatedly and I had to break (destroying the program) to get out of the loop.

May I ask why this occurs, and can the escape routine be modified to prevent this happening (should the routine include machine code to reset the character buffer)?

J. Portwood
Consett

Ian Copestake, the author of the self-destruct mechanism sent in some alterations which should cure your first problem (May issue, page 90).

Your second problem sounds like a programming fault, and the escape routine clears all buffers automatically unless otherwise disabled.

ELECTRON GOTO

Sir, Thank you for your kind reference to my *Start Programming with the Electron* book (September). However, I feel obliged to pick up some of the inaccuracies.

There actually is a single, lonely GOTO statement on page 90 of the book which is used with the ON ERROR command. Its function is described along with ON ERROR in the box at the end of the sound chapter. Unfortunately this has been omitted (due to shortage of space) in the early printing of the book. The second printing remedies this as well as containing an index.

The programs associated with the book are not only listed at the back, but are also provided on the Welcome cassette. You need to start using the B side of the cassette, and you need to rewind it first. In this way you get a free turtle graphics package, seven mazes to solve, the 'greeter' program and the river-game.

Originally there were two listings of the river-game (with and without graphics). Only the latter is included in the early printing. This is the program on the cassette, while chapter 12 refers to the listing of the program without graphics. As a result readers need to cope with any mismatch. The second printing includes the version referred to in chapter 12 while leaving the addition of graphics as an exercise for the readers!

To check whether your copy of the book is an early printing, look at the index, or the first cartoon (or should I say carton to be consistent with your reference?).

Masoud Yazdani
Exeter University

COURSE JOB

Sir, As a college we have been running courses for the handicapped over a number of years and have introduced microcomputers. However, we have found the tradi-

tional keyboard limiting with our students and hence propose to develop touch sensitive screens with the BBC computer.

As a result, we will soon have available a temporary one-year post for a computer programmer and software writer. The salary will be based on Lecturer Grade 1 scale. Anyone interested in the development of this exciting field can obtain further information from me at Trowbridge Technical College, College Rd, Trowbridge, Wiltshire BA14 0ES.

Alun Maddocks
Trowbridge Technical
College

HOSPITAL CALLS

Sir, Being the proud owner of a BBC model B, and very much aware of its built-in interface capabilities, I was inspired by the news item 'Micro plays major role in medicine' (July).

After consulting my Controlling Officer, he agreed it would be interesting to try to correspond with people developing hardware and software for the Beeb in a hospital environment. We are also interested in applications involving aid to disabled and handicapped persons.

Could you assist in enabling us to contact some of the people involved? Any help would be greatly appreciated.

Thank you for your service. Your magazine is well regarded here in New Zealand. Our address is Medical Electronics Dept, Hawke's Bay Hospital Board, Napier Hospital, Private Bag, Napier, New Zealand.

Kendall Julian
Napier Hospital
New Zealand

INTERFACE NEWS

Sir, Thank you for the excellent review of our analogue to digital converter in August's *Acorn User*. We have taken Chris Smith's point about the instructions and indeed have been in the process of re-writing them for some time. New instructions are now issued with every A/D unit, and free copies are available to old customers.

Some misunderstanding has arisen about the availability of the unit. It can be purchased direct from us as well as from Philip Harris Limited, although the price structures are identical. Perhaps you would be kind enough to make this clear to your readers.

Eve Gorton
Blackboard Electronics
Stockport

DISC REVISION

Sir, I was interested to see the article by Nigel Pendleton in your October 1983 issue, not least because I have been using (and selling) a version of this program.

I have typed in Mr Pendleton's program and would like to make one or two comments about it which may be of interest to others. First, the disc drive prompted for in line 110 is written into the code when it is assembled. If the program is run on drive 0 and the disc is put into drive 1 of a twin drive machine, then ALT will still think it is in drive 0 and will try to access the wrong drive—with potentially disastrous results. The program should be modified to allow for such a drive change.

The simplest way of doing this is to change line 640 to LDA &10CB.

Second, as Mr Pendleton states, all of the DFS commands should work. However, it is important to realise that when a dual catalogue is being backed up or verified, the catalogue with all 80 tracks (ie, the one with Z.ZZ in it) should be active. Otherwise, the command will think it is a 40-track disc and only copy over or verify the first half of the disc.

In my own version I have found it useful to include error handling in case of faulty

disc reads/writes and also to check whether the disc being used really *is* a dual catalogue disc before attempting to swap the catalogues. These precautions are as a result of bitter experience. It is rather depressing to scramble a disc of valuable programs by mistake!

One technique of interest here is the use of OSGBPB (&FFD1) (line 280 of my program CATCODE) to find the current disc drive. You can use ?&10CB but this is frowned upon by Acorn, and the location is not guaranteed with any new DFS. After a call to OSGBPB with A=5 the current directory is returned together with other information. This call is not fully documented in the *User Guide* but is mentioned in the Econet manual and in the excellent *Advanced User Guide* recently published by Cambridge Microcomputer Centre.

Robin Newman
Microelectronics Centre
Oundle

ATOM VOICE

Sir, Congratulations on the publication of the anniversary issue of *Acorn User*. However, I feel I must resurrect a subject which was aired early on in the magazine's career. Namely the amount of space and number of articles dedicated to the BBC micro.

The editorial for the July issue makes it appear that the strategy was to launch a magazine into what was originally a vacuum of information on the BBC micro. The Electron, which has not yet been launched, is mentioned, but not a word about the humble Atom.

In all fairness you have had some good articles on the Atom, but would it not be possible to parallel some of the BBC articles for the Atom?

A little more thought might make we Atom owners feel less out in the cold: for example, there is an information sheet available of the Seikosha printer, not for Acorn machines as you would expect, but for the BBC micro only.

The introduction of Atom Forum is a step in the right direction; I hope you will try and involve the Atom, and soon the Electron, in more of your articles.

Andrew Ward
London

CONNED AND CHEATED

Sir, I am the owner of a 12k Atom, and I appear to have made a major mistake in purchasing this now obsolete micro. There is usually just one article per month in *Acorn User*. Acorn has abandoned development of new hardware (and probably software). Finally, there are hardly any advertisers in *Acorn User* with Atom equipment. Come on admit it Acorn, you conned us Atom purchasers. The Electron is the new baby: the Atom is dead. All this new equipment, and all financed with profits from Atom sales.

I feel *very* cheated and I bet neither you or Acorn can give me any hope (like a decent way to swap from Atom Basic to genuine BBC Basic).

M. Collins
Chelmsford

We hope the article in October's issue has made our position clear on the Atom. The Atom will continue to 'live' as long as people use it. Let's face it, where do people stand when their washing machine, car, vacuum cleaner goes out of production or breaks down? Why should a computer be different?

Do people feel 'conned' or cheated when a new Jaguar, comes out? And who did the conning? Acorn hasn't advertised the Atom in *Acorn User* since last December's issue. Yet it was still in the top 20 sellers at the end of May according to one of the weekly computer magazines.

ANY QUESTIONS?

Sir, I have noticed a scrolling fault on my 32k BBC micro model A (and all others I have seen) which appears to occur in any mode with and without text windows on monitors and televisions.

When the screen is scrolling the picture (or part of it) jumps to the right and returns to normal immediately. The jump is distracting and in the following program occurs after 10,000 numbers have been printed (10 For A=0 to 1000000:P.A:N.). What causes the jump? Does the Beeb beat the VDU? How can I stop the screen jump? Would *FX19 and interlace off on the 1.2 operating system have any effect?

Is the PLOT 73 series on the OS 1.2 an area fill command or is some form of PAINT command available in Basic II? I would be grateful if someone could supply me with an area-fill routine.

I believe *FX202,x (where x = 16/32/48/0 or 6.4) operates the caps and shift locks on OS 1.2.

What chips will I need to add to my 32k BBC micro (with 6522) to use extra language ROMs. Which sockets should they be inserted into and which links need altering. Will Forth be available in ROM to 1979 standard?

How much would it cost to have an RS423 port installed in my computer (including postage, etc)? Also how well does Acornsoft Chess compare to Program Power's in strength of relay?

I would be grateful, being a younger reader to whom it is supposed to appeal, if you could find some cure for the annoying 'acne' which infects some pages of your magazine (eg March, p43, 58, May p84, etc) because it renders some text almost illegible.

Would it not be better to include, in the competition page, the setting of a program task to encourage good, interesting, useful programming, rather than unproductive problems?—I would prefer to buy a problem book!

Nevertheless, keep up the excellent work on the magazine—the machine code, music and graphics articles were much appreciated!

Thank you in advance for answering my queries.

C. Bowerman
Nuneaton

Taking a deep breath, here come the answers!

The 'jumping' of the screen you describe is caused by a vertical sync pulse occurring during a re-write of the screen start address in the 6845. This is a two-byte value, and if a VSYNC occurs between the writing of the two bytes, the screen will be read from the wrong address whilst the VSYNC is handled by the MOS, thus causing a momentary 'jump'. Not a lot you can do about it.

PLOT 73, etc are provided for use by the user and are not directly exploited by any current issues of Basic. (See August issue.)

OK, you're right (but who cares?).

To use the extra language ROMs a 74LS163 (IC76) must be fitted, links S12 and S13 cut and the following links set: S26 W; S18 N; S20 N; S22 N; S21 E-W; S32 W; S33 W. Note that the keyboard is south. Forth will be available, but Acornsoft couldn't say when.

To instal RS423, fit IC74 with a DS88LS120N, IC75 with DS3691N and an appropriate five-pin socket. As for prices, phone round your local dealers.

A review of Acornsoft Chess and BBC Soft's Chess is underway.

'Acne! I'll give him acne!' said our designer. It's a good job I didn't give him your address.

The whole of *Acorn User* is devoted to encouraging good, interesting, useful programming. The competition is also there for stimulation, ideas and frustration—plus the chance to win something. What about the Hawks and Doves competition? There's a task for you.

SOUND AND VISION

Sir, I too suffered from the sound and vision symptoms described by Mr Pyrah (July letters) before locating and effecting a cure. The solution is too lengthy to describe, but if Mr Pyrah or others afflicted would care to write to me at 29 Endsleigh Court, Colchester, enclosing a sae I will return information on how to proceed.

D. Lawrence
Colchester

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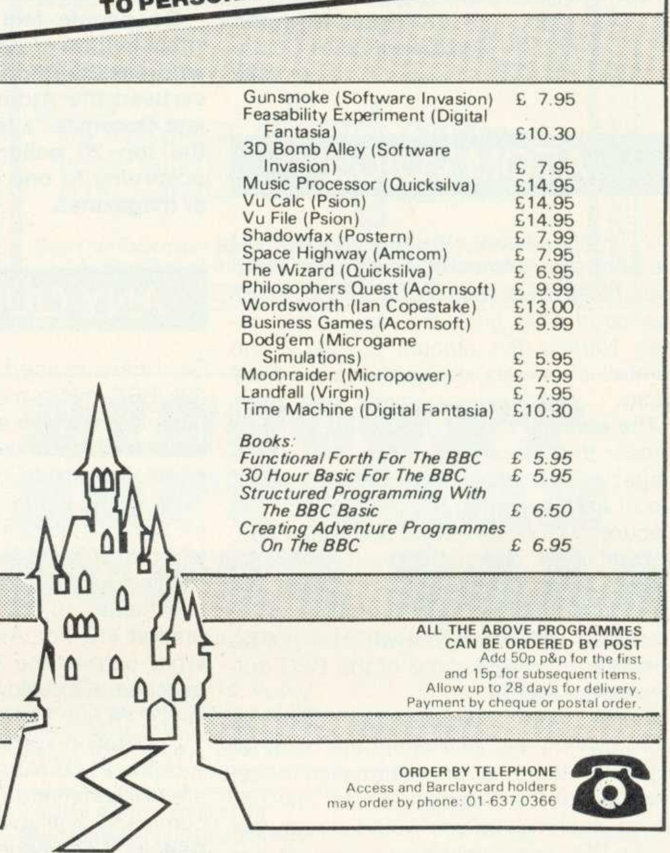
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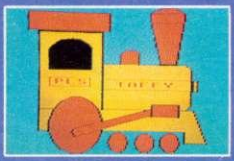
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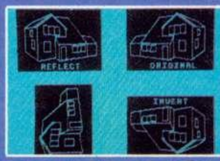
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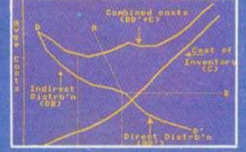
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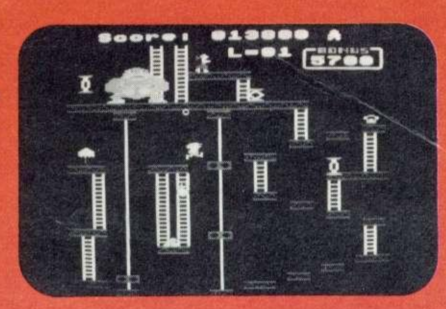


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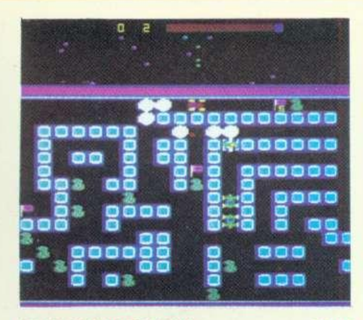
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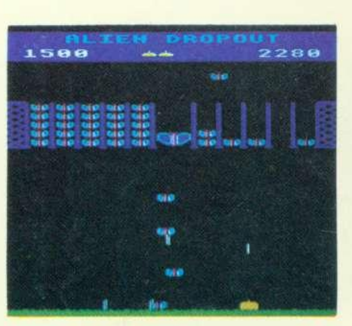
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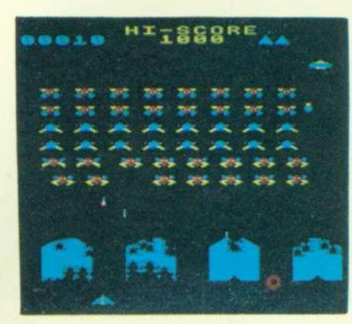
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